engineering new zealand

ace new zealand

association of consulting and engineering

Building Code Clause(s)...**B1, F2, & F4**.....

PRODUCER STATEMENT – PS1 – DESIGN

ISSUED BY: :......................................**AIREY CONSULTANTS LTD**.................. **AUTHOR NO: 2058**.......................
(Design Firm)

TO ... .**GLASS VICE PRODUCTS** ....
(Owner/Developer)

TO BE SUPPLIED TO: ....**Far North District Council** ....
(Building Consent Authority)

IN RESPECT OF:......... **12 MM TOUGHENED SAFETY GLASS (TSG) RESIDENTIAL BARRIER** ....
(Description of Building Work)

AT ..**ANYWHERE IN NZ WHERE MAX HIGH (1100 TALL) OR VERY HIGH (1000 TALL) WIND ZONE AS DEF. BY NZS 3604**
...36 Old Hospital Road, Whangaroa..........................(Address)

Town/City:..Whangaroa........................... **LOT**........1....... **DP**....184536.... **SO**...........
(Address)

We have been engaged by the owner/developer referred to above to provide:
.... **Structural Engineering design of elements as detailed in the attached PS1 schedule** ....
(Extent of Engagement)

services in respect of the requirements of Clause(s)... **B1, F2 & F4**.......of the Building Code for:

☐ All or ☒ Part only (as specified in the attachment to this statement), of the proposed building work.

The design carried out by us has been prepared in accordance with:

☒ Compliance Documents issued by the Ministry of Business, Innovation & Employment...**B1VM1, F2AS1 & F4AS1**.......or
(verification method/acceptable solution)

☐ Alternative solution as per the attached schedule .... The proposed building work covered by this producer

statement is described on the drawings titled:

.. **GLASS VICE 12 MM TSG RESIDENTIAL BARRIER**, by **GLASS VICE PRODUCTS LTD.**, numbered **180297-02** and dated **September and Nov 2021** ....; together with the specification, and other documents set out in the schedule attached to this statement.

On behalf of the Design Firm, and subject to:
(i) Site verification of the following design assumptions ...... **suitability of supporting structure confirmed by others** ....
(ii) All proprietary products meeting their performance specification requirements;

I believe on reasonable grounds that a) the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached schedule, will comply with the relevant provisions of the Building Code and that b), the persons who have undertaken the design have the necessary competency to do so. I also recommend the following level of construction monitoring/observation:

☒CM1 ☐CM2 ☐CM3 ☐CM4 ☐CM5 (Engineering Categories)

I............................... **DAVID N MCKENZIE**... am: ☒ CPEng ......**163757**.......
(Name of Design Professional)

I am a member of: ☒ Engineering New Zealand and hold the following qualifications:. ...**CPEng, CMEngNZ, IntPE(NZ), BE (Civil)**...The Design Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than $200,000*.

The Design Firm is a member of ACE New Zealand: ☒

SIGNED BY..............................**DAVID N MCKENZIE**..............................(Signature)..
(Name of Design Professional)

ON BEHALF OF ....**AIREY CONSULTANTS LTD**..Date...21/03/2022....
(Design Firm)

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of $200,000.*

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

engineering new zealand | New Zealand Institute of Architects Incorporated | ACENZ

Building Code Clause(s)... **B1, B2 and F4**.....

PRODUCER STATEMENT – PS1 – DESIGN

(Guidance on use of Producer Statements (formerly page 2) is available at www.engineeringnz.org)

ISSUED BY: :......................................**AIREY CONSULTANTS LTD**................. **AUTHOR NO: 2058**.................
(Construction Review Firm)

TO: ....**GLASS VICE PRODUCTS LTD.** ....
(Owner/Developer)

TO BE SUPPLIED TO: ....Far North District Council...
(Building Consent Authority)

IN RESPECT OF:.......................................**J-Vice 100 (JV100)** ....
(Description of Building Work)

AT: ANYWHERE IN NEW ZEALAND WHERE THE WIND ZONE IS CONFIRMED TO BE V HIGH OR LESS AS PER NZS3604
..36 Old Hospital Road, Whangaroa......................... (Address)

Town/City:..Whangaroa..................... **LOT**...........1................ **DP**.........184536......... **SO**...............
(Address)

We have been engaged by the owner/developer referred to above to provide:
.........................**Structural Engineering design of elements as detailed in the attached PS1 schedule**.........................
(Extent of Engagement)

services in respect of the requirements of Clause(s)......**B1, B2 and F4**.........of the Building Code for:

☐ All or ☒ Part only (as specified in the attachment to this statement), of the proposed building work.

The design carried out by us has been prepared in accordance with:

☒ Compliance Documents issued by the Ministry of Business, Innovation & Employment..... **B1/VM1, B2/AS1 and F4/AS1**..or
(verification method/acceptable solution)

☐ Alternative solution as per the attached schedule...

The proposed building work covered by this producer statement is described on the drawings:

prepared by: **Glass Vice**, titled: **J-Vice, 3 pages** and dated **30/11/2020 AND** prepared by**: One Stop Cutting Shop,** titled: **J Vice 25 mm** and dated **4/03/2019.**

together with the specification, and other documents set out in the schedule attached to this statement.

On behalf of the Design Firm, and subject to:
Site verification of the following design assumptions ... **Suitability of structure to be fixed to confirmed by others** ....
All proprietary products meeting their performance specification requirements;

I believe on reasonable grounds that a) the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached schedule, will comply with the relevant provisions of the Building Code and that b), the persons who have undertaken the design have the necessary competency to do so. I also recommend the following level of construction monitoring/observation:

☒ CM1 ☐ CM2 ☐ CM3 ☐ CM4 ☐ CM5 (Engineering Categories) or ☐ as per agreement with owner/developer (Architectural)

I.........................**DAVID N MCKENZIE**........................ am: ☒ CPEng ...**163757**..... # ☐ Reg Arch .... #
(Name of Design Professional)

I am a member of: ☒ Engineering New Zealand ☐ NZIA and hold the following qualifications:**CPEng, CMEngNZ, IntPE, BE (Civil)**
The Design Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than $200,000*.
The Design Firm is a member of ACENZ: ☒

SIGNED BY...............................**DAVID N MCKENZIE**................................(Signature)..
(Name of Design Professional)

ON BEHALF OF ....**AIREY CONSULTANTS LTD**...Date...21/03/2022..
(Design Firm)

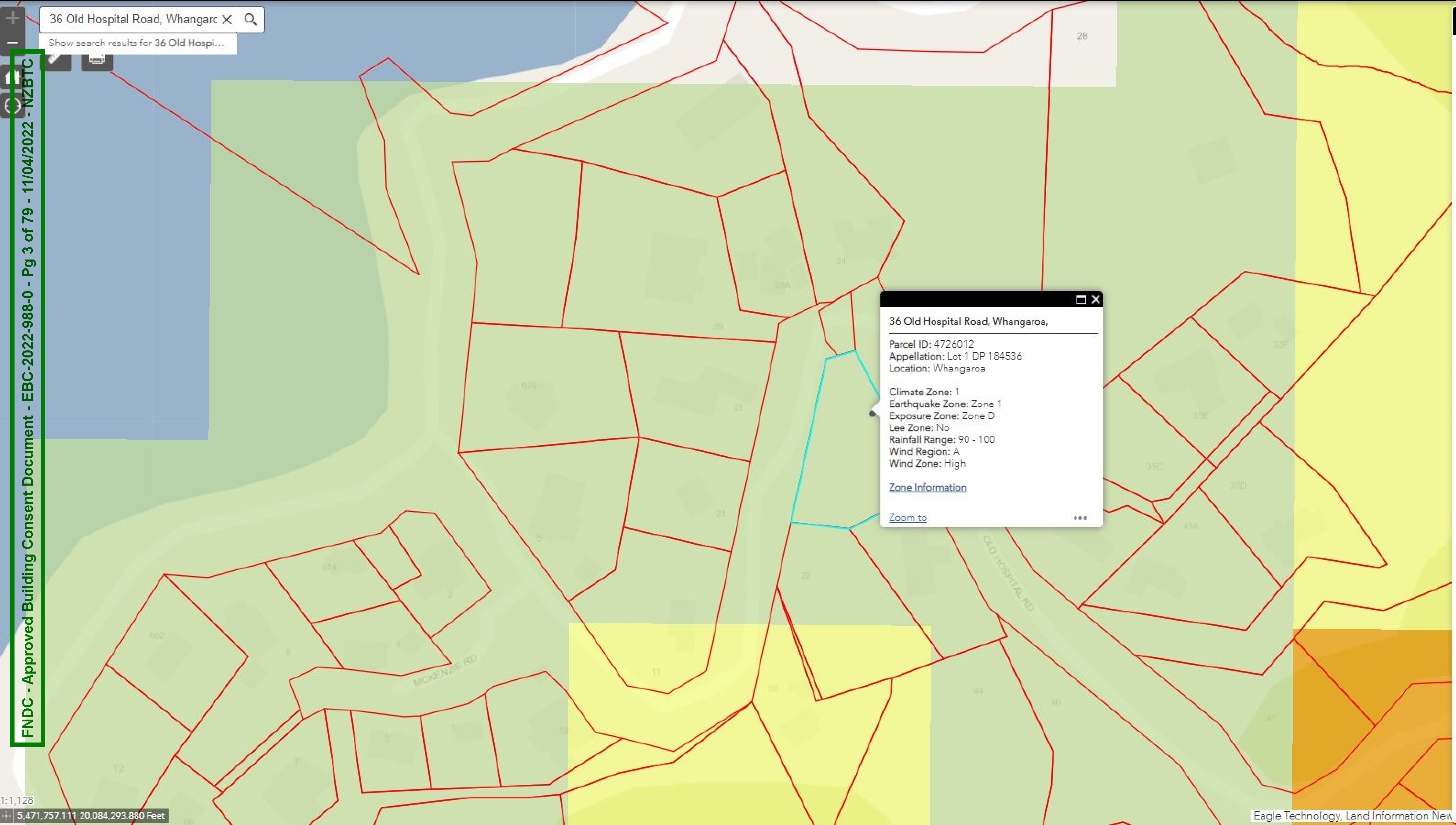
Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of $200,000.*

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

BRANZ Map   About Branz   BRANZ Home Page

36 Old Hospital Road, Whangaro

Show search results for 36 Old Hospi...



Legend and Information

Wind Regions and Lee Zones

- Lee Zones
- A
- W

Wind regions and lee zones are our interpretation of Figure 5.1 in NZS 3604:2011.

Wind Zones

- Low
- Medium
- High
- Very High
- Extra High
- Specific Engineering Design

Wind zones are an output from a 2014 research project at BRANZ. The project aimed to see if the calculation of wind zones (in accordance with NZS 3604:2011) could be automated using GIS (geographic information system) software. The method for calculating wind zones in NZS 3604:2011 is a simplification of the method described in AS/NZS 1170.2:2011 Structural design actions - Part 2: Wind actions.
Several approximations were made in the process of creating the map. Therefore, the wind zones must be treated as indicative and used only as a reference when calculating site-specific wind speed or only in the absence of more reliable data being available.
For example, an up-to-date council-wide wind zone map would be considered higher-resolution data, and a site-specific wind zone calculation would be higher still.
Initial user testing has shown that the wind zones in BRANZ Maps are likely to be inaccurate near escarpments or cliffs.
A description of the method used and a comparison with the few existing council maps can be found in Build 147.

Climate zones

- 1
- 2
- 3

Climate zones are our interpretation of Figure B1 in NZS 4218:2004 Energy efficiency - Small building envelope.

Rainfall intensity

Glass Vice 12 mm TSG Residential Barrier with Two Standard 316 SS Clamps at 300 mm End Distances – *Summary to be read with full detailed drawings*

Barrier Height	1000 or 1100 mm				
Glass	12 mm Toughened Safety Glass				
Rail	Interlinking Top Cap Rail: 25x21 mm U-shaped Stainless Steel 'Nano-rail'				
Occupancy Type – Barrier for Safety from Falling	AS/NZS 1170.1:2002-A2 Table 3.3 Occupancy Type A – other residential (see loads table below)				
Max Wind Zone	1000 mm high – Very High wind zone / 1100 mm high – High wind zone as per NZS 3604:2011				
Clamps – 316 SS	**AB** Architectural Bracket		**DF** Direct Fix	**SB** Direct Fix + S-Bracket or American Baseplate	
Fixing into Timber	External (wet) timber: (AB05): *OPTION A: 1700 wide panel* 2M10 S.S. lagscrews 135 mm penetration (exc. tip) Min 90 mm vertical spacing (AB05a): *OPTION B: 1100 wide panel* 2M10 S.S. lagscrews 90 mm penetration (exc. tip) Min 90 mm spacing	Internal (dry) timber: (AB02,3,6,7): *OPTION A: 1800 wide panel* 2M10 S.S. lagscrews 135 mm penetration (exc. tip) Min 90 mm vertical spacing (AB02a,3a,6a,7a): *OPTION B: 1600 wide panel* 2M10 S.S. lagscrews 90 mm penetration (exc. tip) Min 90 mm vertical spacing	(DF02) N/A	Min 140 mm deep timbers: (SB02) *1800 wide panel* 2M10 threaded rods in Direct Fix 130 mm penetration 57 mm spacing Hilti HIT-RE 500 V3 epoxy PLUS 2M10 S.S. lagscrews in S-Bracket 90 mm penetration (exc. tip) (SB04) *1800 wide panel* 4M10 S.S. Lagscrews 130 mm penetration Hilti HIT-RE 500 V3 epoxy	Min 90 mm deep timbers: (SB03) *1600 wide panel* 2M10 threaded rods in Direct Fix 80 mm penetration 57 mm spacing Hilti HIT-RE 500 V3 epoxy PLUS 2M10 S.S. lagscrews in S-Bracket 90 mm penetration (exc. tip)
Fixing into Concrete	(AB01) *1700 wide panel* 2M10 Threaded rods Hilti HIT-RE 500 V3 epoxy Min 150 mm penetration Min 70 mm spacing Min 45 mm edge distance		(DF01) *1700 wide panel* Hilti HIT-RE 500 V3 epoxy Min 100 mm penetration 57 mm spacing Min 60 mm edge distance	N/A	
Fixing into Steel	(AB32,35) *1800 wide panel* 2M10 S.S. Bolts Min 70 mm spacing Min 30 mm edge distance to steel		(DF03) *1800 wide panel* 57 mm spacing Min 30 mm edge distance to steel	(SB05) *1800 wide panel* 50 mm spacing Min 30 mm edge distance to steel	

AS/NZS 1170.1:2002-A2 Table 3.3 Occupancy Type A – other residential

Top Edge			Infill	
Horizontal	Vertical	In, out or down	Horizontal	Any Direction
0.75 kN/m	0.75 kN/m	0.6 kN	1.0 kPa	0.5 kN

gv_12mm_TSG_Residential_Barrier.rvt
All dimensions in millimetres

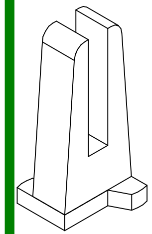
Glass Vice®
Residential Barriers

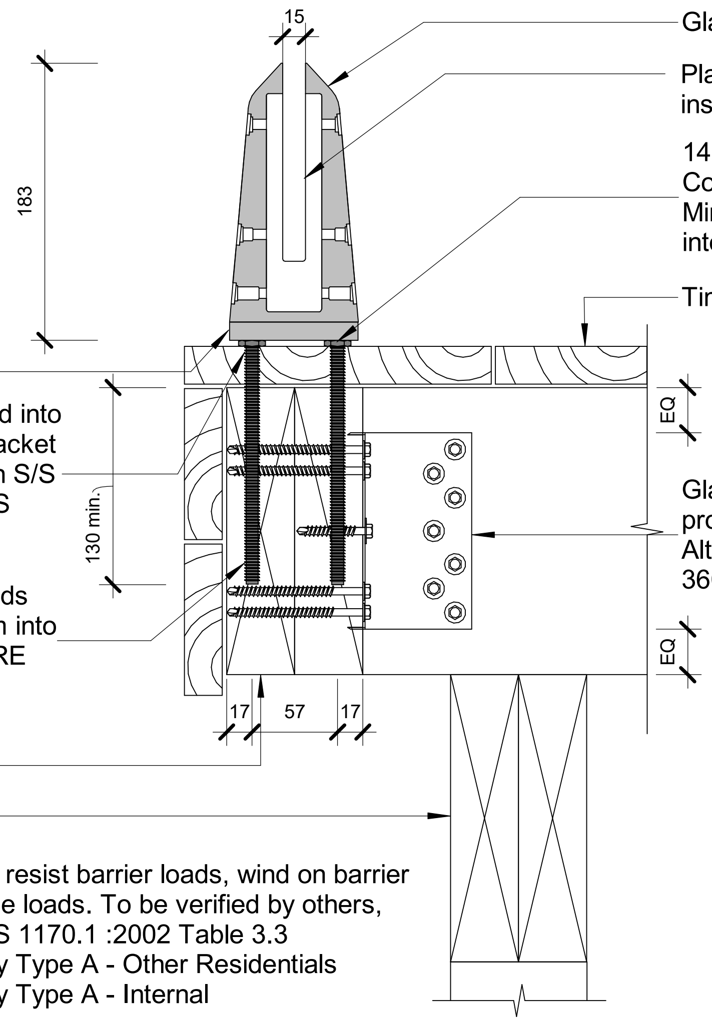
Glass Vice 12 mm TSG Residential Barrier Table
Glass Vice 12 mm TSG Residential Barrier with Two Standard Clamps at 300 mm End Distances

Date: Spetember 2021
Scale: 1 : 1

Quick Code:
GV_VICE_1TSG_12mm_BARR

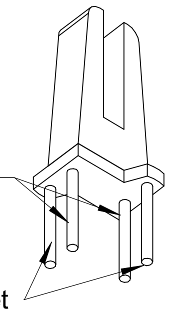
www.glassvice.com
Phone +64 9 414 6565
info@glassvice.com





Supporting structure to resist barrier loads, wind on barrier and any other applicable loads. To be verified by others, barrier loads to AS.NZS 1170.1 :2002 Table 3.3

- Barriers: Occupancy Type A - Other Residentials
- Barriers: Occupancy Type A - Internal



These drawings relate only to the Glass Vice Products and their fixings. All other elements are shown indicative only.

gv_glassvice_details.rvt
All dimensions in millimetres

Glass Vice®

Residential Barrier Details

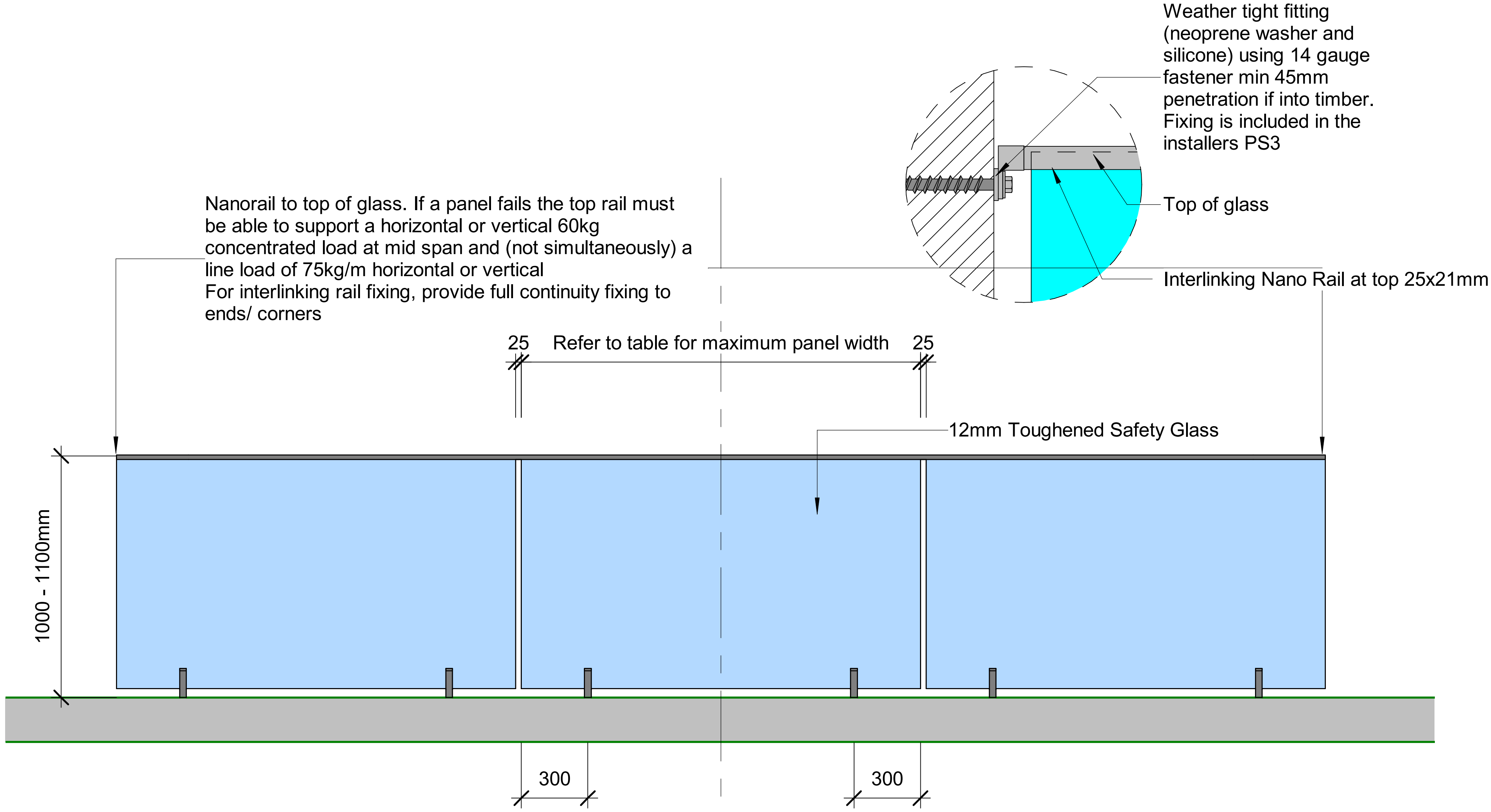
Decking - Top Fix

Date: Nov 2021
Scale: As indicated
1.01

Quick Code:

www.glassvice.com
Phone +64 9 414 6565
info@glassvice.com

GV_VICE_4DET_SB02



GlassVice 12 TSG Residential Barrier

gv_12mm_TSG_Residential_Barrier.rvt
All dimensions in millimetres

GLASS VICE®

Glass Vice®
Residential Barriers

Glass Vice 12 mm TSG Residential Barrier Elevation
Glass Vice 12 mm TSG Residential Barrier with Two Standard Clamps at 300 mm End Distances

Date: Spetember 2021
Scale: As indicated

www.glassvice.com
Phone +64 9 414 6565
info@glassvice.com

Quick Code:
GV_VICE_1TSG_12mm_BARR_ELE

AIREY CONSULTANTS LTD.

STRUCTURAL ENGINEERING CALCULATIONS

Job: 12 mm Toughened Safety Glass – Barrier

Location: NZ Wide

Client: Glass Vice Products Ltd.

Job No: 180297/02

Date: 4-6-2021/19-10-2021

Design Engineer: MJ/TJ

Reviewed by: DM

Contact Phone: (09) 534 6523 **Email:** botany@aireys.co.nz

Index:

Glass Vice 12 mm TSG Residential Barrier with Two Standard Clamps at 300 mm End Distances – ***Summary to be read with full detailed drawings***

<table>
<tr><td>Barrier Height</td><td colspan="5">1000 or 1100 mm</td></tr>
<tr><td>Glass</td><td colspan="5">12 mm Toughened Safety Glass</td></tr>
<tr><td>Rail</td><td colspan="5">Interlinking Top Cap Rail: 25x21 mm U-shaped Stainless Steel ‘Nano-rail’</td></tr>
<tr><td>Occupancy Type – Barrier for Safety from Falling</td><td colspan="5">AS/NZS 1170.1:2002-A2 Table 3.3 Occupancy Type A – other residential
<table>
<tr><td colspan="3">Top Edge</td><td colspan="2">Infill</td></tr>
<tr><td>Horizontal</td><td>Vertical</td><td>In, out or down</td><td>Horizontal</td><td>Any Direction</td></tr>
<tr><td>0.75 kN/m</td><td>0.75 kN/m</td><td>0.6 kN</td><td>1.0 kPa</td><td>0.5 kN</td></tr>
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Direct Fix</td><td colspan="2">SB
Direct Fix + S-Bracket or American Baseplate</td></tr>
<tr><td>Fixing into Timber</td><td><u>External (wet) timber:</u>

(AB05):
OPTION A: 1700 wide panel
2M10 S.S. lagscrews
135 mm penetration (exc. tip)
Min 90 mm vertical spacing

(AB05a):
OPTION B: 1100 wide panel
2M10 S.S. lagscrews
90 mm penetration (exc. tip)
Min 90 mm spacing</td><td><u>Internal (dry) timber:</u>

(AB02,3,6,7):
OPTION A: 1800 wide panel
2M10 S.S. lagscrews
135 mm penetration (exc. tip)
Min 90 mm vertical spacing

(AB02a,3a,6a,7a):
OPTION B: 1600 wide panel
2M10 S.S. lagscrews
90 mm penetration (exc. tip)
Min 90 mm vertical spacing</td><td>(DF02)
N/A</td><td><u>Min 140 mm deep timbers:</u>
(SB02)
1800 wide panel
2M10 threaded rods in Direct Fix
130 mm penetration
57 mm spacing
Hilti HIT-RE 500 V3 epoxy

PLUS

2M10 S.S. lagscrews in S-Bracket
90 mm penetration (exc. tip)

(SB04)
1800 wide panel
4M10 S.S. Lagscrews
130 mm penetration
Hilti HIT-RE 500 V3 epoxy</td><td><u>Min 90 mm deep timbers:</u>
(SB03)
1600 wide panel
2M10 threaded rods in Direct Fix
80 mm penetration
57 mm spacing
Hilti HIT-RE 500 V3 epoxy

PLUS

2M10 S.S. lagscrews in S-Bracket
90 mm penetration (exc. tip)</td></tr>
<tr><td>Fixing into Concrete</td><td colspan="2">(AB01)
1700 wide panel
2M10 Threaded rods
Hilti HIT-RE 500 V3 epoxy
Min 150 mm penetration
Min 70 mm spacing
Min 45 mm edge distance</td><td>(DF01)
1700 wide panel
Hilti HIT-RE 500 V3 epoxy Min 100 mm penetration
57 mm spacing
Min 60 mm edge distance</td><td colspan="2">N/A</td></tr>
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1800 wide panel
2M10 S.S. Bolts
Min 70 mm spacing
Min 30 mm edge distance to steel</td><td>(DF03)
1800 wide panel
57 mm spacing
Min 30 mm edge distance to steel</td><td colspan="2">(SB05)
1800 wide panel
50 mm spacing
Min 30 mm edge distance to steel</td></tr>
</table>

Glass Fence/Barrier Check

Job number	180297	Engineer	MJ/TJ
Client	Glass Vice Products Ltd.	Date	19/10/2021

Loading Nanorail, not interlinking rail. Residential only

F4 - 1000 High - 12mm TSG

Nanorail

FIXING DETAIL													
Detail number	**AB05**	**AB02,3,6,7**	**AB05**	**AB02,3,6,7**	**AB01**	**AB32,AB35**	**DF01**	**DF03**	**SB02**	**SB03**	**SB04/QUAL**	**SB05**	
Substrate	Timber wet	Timber dry	Timber wet	Timber dry	Concrete	Steel	Concrete	Steel	Timber wet	Timber wet	Timber wet	Steel	
Orientation	Side	Side	Side	Side	Side	Side	Top	Top	Top	Top_90d	Top_90d	Top	
Num b'dry	2	2	3	3	-	-	-	-	2	2	2	-	
FFL to top fixing	55	55	55	55	55	55	0	0	0	0	0	0	max
Top fix to btm	90	90	90	90	70	70	0	0	0	0	0	0	
Fixing spacing	90	90	90	90	70	70	57	57	57	57	49	49	
LF	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
POINT LOAD													
Load	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	kN
Load Ht	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	mm
P* total	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	kN
Share by	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	vices
P* per vice	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	kN
M* at FFL /vice	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	kNm
Nt* /vice	5.73	5.73	5.73	5.73	7.23	7.23	7.89	7.89	7.89	7.89	9.18	9.18	kN
LINE LOAD													
Load	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	kN/m
Load Ht	900	900	900	900	900	900	900	900	900	900	900	900	
Panel width	**1100**	**1600**	**1700**	**1800**	**1700**	**1800**	**1700**	**1800**	**1800**	**1600**	**1800**	**1800**	mm
Num vice	2	2	2	2	2	2	2	2	2	2	2	2	per panel
P* per vice	0.62	0.90	0.96	1.01	0.96	1.01	0.96	1.01	1.01	0.90	1.01	1.01	kN
M* at FFL /vice	0.56	0.81	0.86	0.91	0.86	0.91	0.86	0.91	0.91	0.81	0.91	0.91	kNm
Nt* /vice	7.18	10.45	11.10	11.76	14.00	14.83	15.10	15.99	15.99	14.21	18.60	18.60	kN
INFILL LIVE LOAD													
Load	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	kPa
Panel Ht	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	per panel
P* total	1.65	2.4	2.55	2.7	2.55	2.7	2.55	2.7	2.7	2.4	2.7	2.7	kN
Num Vice	2	2	2	2	2	2	2	2	2	2	2	2	per panel
P* per vice	0.825	1.2	1.275	1.35	1.275	1.35	1.275	1.35	1.35	1.2	1.35	1.35	kN
Load Ht	500	500	500	500	500	500	500	500	500	500	500	500	mm
M* at FFL /vice	0.41	0.60	0.64	0.68	0.64	0.68	0.64	0.68	0.68	0.60	0.68	0.68	kNm
Nt* /vice	5.91	8.60	9.14	9.68	11.38	12.05	11.18	11.84	11.84	10.53	13.78	13.78	kN
INFILL WIND LOAD													
Wind Zone	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	
Impo level	2	2	2	2	2	2	2	2	2	2	2	2	
Wind speed	50	50	50	50	50	50	50	50	50	50	50	50	m/s
Wind press	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	kPa
Cp,n	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	
Wind lat press	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	KPa
P* total	1.98	2.88	3.06	3.24	3.06	3.24	3.06	3.24	3.24	2.88	3.24	3.24	kN
Num Vice	2	2	2	2	2	2	2	2	2	2	2	2	
P* per vice	0.99	1.44	1.53	1.62	1.53	1.62	1.53	1.62	1.62	1.44	1.62	1.62	kN
Load Ht	500	500	500	500	500	500	500	500	500	500	500	500	mm
M* at FFL /vice	0.50	0.72	0.77	0.81	0.77	0.81	0.77	0.81	0.81	0.72	0.81	0.81	kNm
Nt* /vice	7.10	10.32	10.97	11.61	13.66	14.46	13.42	14.21	14.21	12.63	16.53	16.53	kN
GOVERNING CASE													
M* at FFL /vice	0.56	0.81	0.86	0.91	0.86	0.91	0.86	0.91	0.91	0.81	0.91	0.91	kNm
Case	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	
Nt* /vice	7.18	10.45	11.10	11.76	14.00	14.83	15.10	15.99	15.99	14.21	18.60	18.60	kN
Case	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	

Fixing Capacity

Side Fixed Timber

Cap per mm	89	126	89	126								
Pen provided	90	90	135	135								
phiQn	8.01	11.34	12.02	17.01	15.08	23.20		23.20				46.40
Nt*/phiQn	0.90	0.92	0.92	0.69	0.93	0.64		0.69				0.40

Other

AB01	AB01		15.08	kN			Refer hand calcs					
AB32,AB35,DF03	AB32,AB35,DF03		23.2	kN			Refer hand calcs					
DF01	DF01		0.92	kNm			Refer hand calcs					
DF02	DF02		0.87	kNm			Refer hand calcs					
SB02	SB02		1.07	kNm			Refer hand calcs					
SB03	SB03		1.00	kNm			Refer hand calcs					
SB04/QUAD	QUAD_F		1.01	kNm			Refer hand calcs					
Capacity							0.92		1.07	1.00	1.01	
M*/Capacity							0.94		0.85	0.81	0.91	

Glass Capacity

Refer to test report

Test Info

	P test	Load ht	Num vice	M per vice	Panel w	Panel w	
	kN	m		kNm	mm	mm	
12 mm TSG	1.94	1.0	2	0.97	1600	1600	
15 mm TSG	2.61	1.2	2	1.57	2000	2000	
13.52 mm LSG	1.94	1.0	2	0.97	1800	0	
15.52 mm LSG	2.65	1.1	2	1.39	1200	1200	Adopt lower of the two 15.52 mm LSG tests
	2.87	1.0	2	1.44	1800	1800	

P test is the minimum test result divided by kt

Note: If going to v narrow panels, then load in kN capacity may reduce, esp. if vices not well spaced in between or from panel edge

M*/Capacity

12 mm TSG	0.57	0.84	0.89	0.94	0.89	0.94	0.89	0.94	0.94	0.84	0.94	0.94
15 mm TSG	0.36	0.52	0.55	0.58	0.55	0.58	0.55	0.58	0.58	0.52	0.58	0.58
13.52 mm LSG	0.57	0.84	0.89	0.94	0.89	0.94	0.89	0.94	0.94	0.84	0.94	0.94
15.52 mm LSG	0.40	0.58	0.62	0.65	0.62	0.65	0.62	0.65	0.65	0.58	0.65	0.65

Normal 316 SS Vice
Duplex 2205 SS Vice

Normal 316 SS V	0.61	0.89	0.94	1.00	0.94	1.00	0.94	1.00	1.00	0.89	1.00	1.00
Duplex 2205 SS V	0.27	0.40	0.42	0.45	0.42	0.45	0.42	0.45	0.45	0.40	0.45	0.45

Glass Fence/Barrier Check

Job number	180297	Engineer	MJ/TJ
Client	Glass Vice Products Ltd.	Date	19/10/2021

Loading

Nanorail, not interlinking rail. Residential only

F4 - 1100 High - 12mm TSG

Nanorail

FIXING DETAIL													
Detail number	**AB05**	**AB02,3,6,7**	**AB05**	**AB02,3,6,7**	**AB01**	**AB32,AB35**	**DF01**	**DF03**	**SB02**	**SB03**	**SB04/QUAD**	**SB05**	
Substrate	Timber wet	Timber dry	Timber wet	Timber dry	Concrete	Steel	Concrete	Steel	Timber wet	Timber wet	Timber wet	Steel	
Orientation	Side	Side	Side	Side	Side	Side	Top	Top	Top	Top_90d	Top_90d	Top	
Num b'dry	2	2	3	3	-	-	-	-	2	2	2	-	
FFL to top fixing	55	55	55	55	55	55	0	0	0	0	0	0	max
Top fix to btm	90	90	90	90	70	70	0	0	0	0	0	0	
Fixing spacing	90	90	90	90	70	70	57	57	57	57	49	49	
LF	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
POINT LOAD													
Load	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	kN
Load Ht	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	mm
P* total	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	kN
Share by	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	vices
P* per vice	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	kN
M* at FFL /vice	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	kNm
Nt* /vice	6.23	6.23	6.23	6.23	7.88	7.88	8.68	8.68	8.68	8.68	10.10	10.10	kN
LINE LOAD													
Load	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	kN/m
Load Ht	900	900	900	900	900	900	900	900	900	900	900	900	
Panel width	**1100**	**1600**	**1700**	**1800**	**1700**	**1800**	**1700**	**1800**	**1800**	**1600**	**1800**	**1800**	mm
Num vice	2	2	2	2	2	2	2	2	2	2	2	2	per panel
P* per vice	0.62	0.90	0.96	1.01	0.96	1.01	0.96	1.01	1.01	0.90	1.01	1.01	kN
M* at FFL /vice	0.56	0.81	0.86	0.91	0.86	0.91	0.86	0.91	0.91	0.81	0.91	0.91	kNm
Nt* /vice	7.18	10.45	11.10	11.76	14.00	14.83	15.10	15.99	15.99	14.21	18.60	18.60	kN
INFILL LIVE LOAD													
Load	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	kPa
Panel Ht	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	per panel
P* total	1.815	2.64	2.805	2.97	2.805	2.97	2.805	2.97	2.97	2.64	2.97	2.97	kN
Num Vice	2	2	2	2	2	2	2	2	2	2	2	2	per panel
P* per vice	0.9075	1.32	1.4025	1.485	1.4025	1.485	1.4025	1.485	1.485	1.32	1.485	1.485	kN
Load Ht	550	550	550	550	550	550	550	550	550	550	550	550	mm
M* at FFL /vice	0.50	0.73	0.77	0.82	0.77	0.82	0.77	0.82	0.82	0.73	0.82	0.82	kNm
Nt* /vice	7.01	10.19	10.83	11.47	13.52	14.32	13.53	14.33	14.33	12.74	16.67	16.67	kN
INFILL WIND LOAD													
Wind Zone	High	High	High	High	High	High	High	High	High	High	High	High	
Impo level	2	2	2	2	2	2	2	2	2	2	2	2	
Wind speed	44	44	44	44	44	44	44	44	44	44	44	44	m/s
Wind press	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	kPa
Cp,n	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	
Wind lat press	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	KPa
P* total	1.69	2.45	2.61	2.76	2.61	2.76	2.61	2.76	2.76	2.45	2.76	2.76	kN
Num Vice	2	2	2	2	2	2	2	2	2	2	2	2	
P* per vice	0.84	1.23	1.30	1.38	1.30	1.38	1.30	1.38	1.38	1.23	1.38	1.38	kN
Load Ht	550	550	550	550	550	550	550	550	550	550	550	550	mm
M* at FFL /vice	0.46	0.67	0.72	0.76	0.72	0.76	0.72	0.76	0.76	0.67	0.76	0.76	kNm
Nt* /vice	6.51	9.47	10.06	10.66	12.57	13.31	12.58	13.32	13.32	11.84	15.49	15.49	kN
GOVERNING CASE													
M* at FFL /vice	0.56	0.81	0.86	0.91	0.86	0.91	0.86	0.91	0.91	0.81	0.91	0.91	kNm
Case	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	
Nt* /vice	7.18	10.45	11.10	11.76	14.00	14.83	15.10	15.99	15.99	14.21	18.60	18.60	kN
Case	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	LINE LOAD	

Fixing Capacity

Side Fixed Timber

Cap per mm	89	126	89	126								
Pen provided	90	90	135	135								
phiQn	8.01	11.34	12.02	17.01	15.08	23.20		23.20				46.40
Nt*/phiQn	0.90	0.92	0.92	0.69	0.93	0.64		0.69				0.40

Other

AB01	AB01		15.08	kN			Refer hand	Refer hand calcs				
AB32,AB35,DF03	AB32,AB35,DF03		23.2	kN			Refer hand	Refer hand calcs				
DF01	DF01		0.92	kNm			Refer hand	Refer hand calcs				
DF02	DF02		0.87	kNm			Refer hand	Refer hand calcs				
SB02	SB02		1.07	kNm			Refer hand	Refer hand calcs				
SB03	SB03		1.00	kNm			Refer hand	Refer hand calcs				
SB04/QUAD	QUAD_F		1.01	kNm			Refer hand	Refer hand calcs				
Capacity							0.92		1.07	1.00	1.01	
M*/Capacity							0.94		0.85	0.81	0.91	

Glass Capacity

Refer to test report

Test Info

	P test	Load ht	Num vice	M per vice	Panel w	Panel w	
	kN	m		kNm	mm	mm	
12 mm TSG	1.94	1.0	2	0.97	1600	1600	
15 mm TSG	2.61	1.2	2	1.57	2000	2000	
13.52 mm LSG	1.94	1.0	2	0.97	1800	0	
15.52 mm LSG	2.65	1.1	2	1.39	1200	1200	Adopt lower of the two 15.52 mm LSG tests
	2.87	1.0	2	1.44	1800	1800	

P test is the minimum test result divided by kt

Note: If going to v narrow panels, then load in kN capacity may reduce, esp. if vices not well spaced in between or from panel edge

M*/Capacity

12 mm TSG	0.57	0.84	0.89	0.94	0.89	0.94	0.89	0.94	0.94	0.84	0.94	0.94
15 mm TSG	0.36	0.52	0.55	0.58	0.55	0.58	0.55	0.58	0.58	0.52	0.58	0.58
13.52 mm LSG	0.57	0.84	0.89	0.94	0.89	0.94	0.89	0.94	0.94	0.84	0.94	0.94
15.52 mm LSG	0.40	0.58	0.62	0.65	0.62	0.65	0.62	0.65	0.65	0.58	0.65	0.65

Normal 316 SS Vice
Duplex 2205 SS Vice

Normal 316 SS V	0.61	0.89	0.94	1.00	0.94	1.00	0.94	1.00	1.00	0.89	1.00	1.00
Duplex 2205 SS V	0.27	0.40	0.42	0.45	0.42	0.45	0.42	0.45	0.45	0.40	0.45	0.45

12 mm Toughened Safety Glass with Two Vices at 600 mm crs

Observed by	Lapish Enterprises (Earnest Lapish)
Conducted by	Glass Vice Ltd.
Test Date	26/10/2012

Calculation by	Airey Consultants Ltd.
Engineer	MJ
Calculation date	12/05/2021

	Length	Height	Load Height	
Panel Size	1.6	1.0	1.0	m

12mm TG supported by two Glass Vice brackets at 600mm centres

x (kg) Test load at failure	**x - Avx**	**(x-Avx)^2**	**Outcome**		
284.73	12.90	166.41	Glass Failed		
283.49	11.66	135.96	Glass Failed		
247.27	-24.56	603.19	Glass Failed		
271.83		905.56		SD =	21.28
Avx		Σ(x-Avx)^2			

Coefficient of Variation = SD/Avx	0.078	7.8	%
From AS/NZS 1170.0 2002 kt =	1.25		

Minimum test load (kg)	247.27	kg	
Minimum test load (kN)	**2.43**	**kN**	
Design capacity	**1.94**	**kN**	i.e. lowest test load / kt

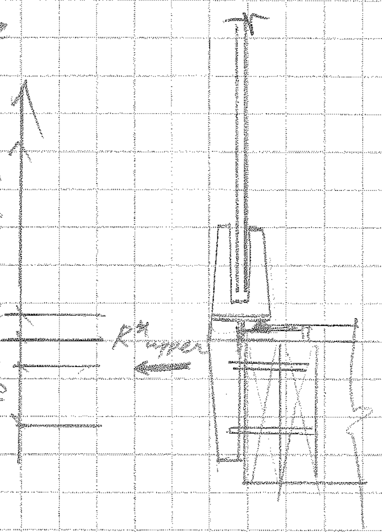
Sharing of Concentrated Load to Vices if No Rail

Consider scenario:

1100 High glass panel 1800 mm wide
(assume 12 mm TSG in FEM)

Architectural Bracket (AB)

Dimensions as here →
& FEM



If the concentrated load is applied to a top corner.

Expected reaction in AB fixings if all load to one AB

$R^*_{upper} = 1.5 \times 0.6 \times (1100 + 40 + 50 + 90)/90 = 12.80\ kN$

c.f. reaction from FEM in Space Gass $= 10.82\ kN$

∴ indicating that some of the load goes into the other bracket that's away from the concentrated load.

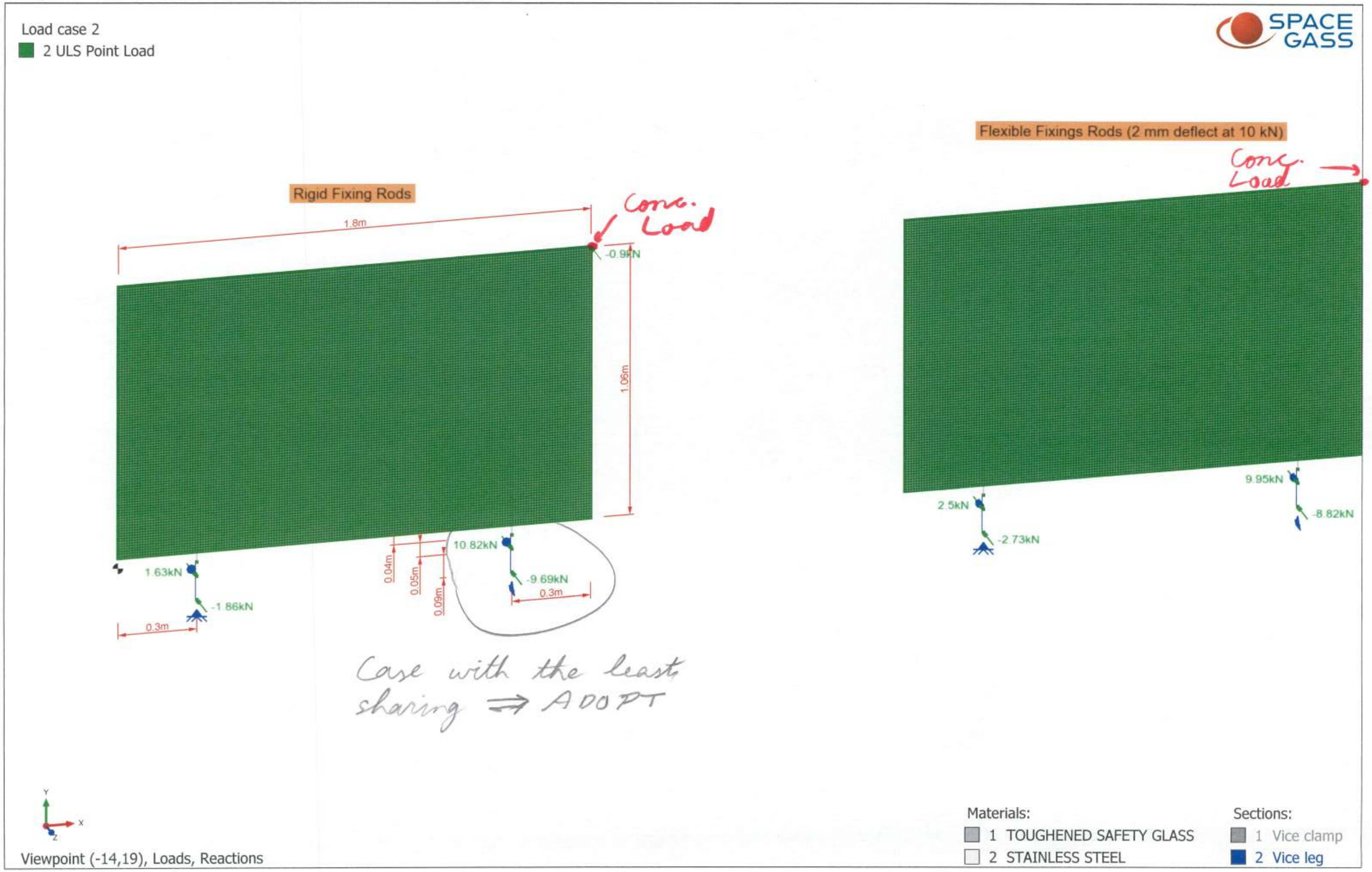
This matches test observation with top corner concentrated loads causing some flexing of the glass & tightening up of the bracket away from the concentrated load.

So effectively shared to $12.80/10.82 = 1.18$ brackets

SAY $\underline{\underline{1.2}}$

Used in spreadsheet

SPACE GASS 14.00 - AIREYS CONSULTANTS LTD
Path: \\Botany-fs1\jobs\180000\180297 GLASS_24c William ...\2_12mm TSG\FEM 3
Designer: Date: Thursday, June 10, 2021 8:41 AM, Page: 1



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SPACE GASS 14.00 - AIREYS CONSULTANTS LTD
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Designer:  Date: Thursday, June 10, 2021 8:50 AM, Page: 1
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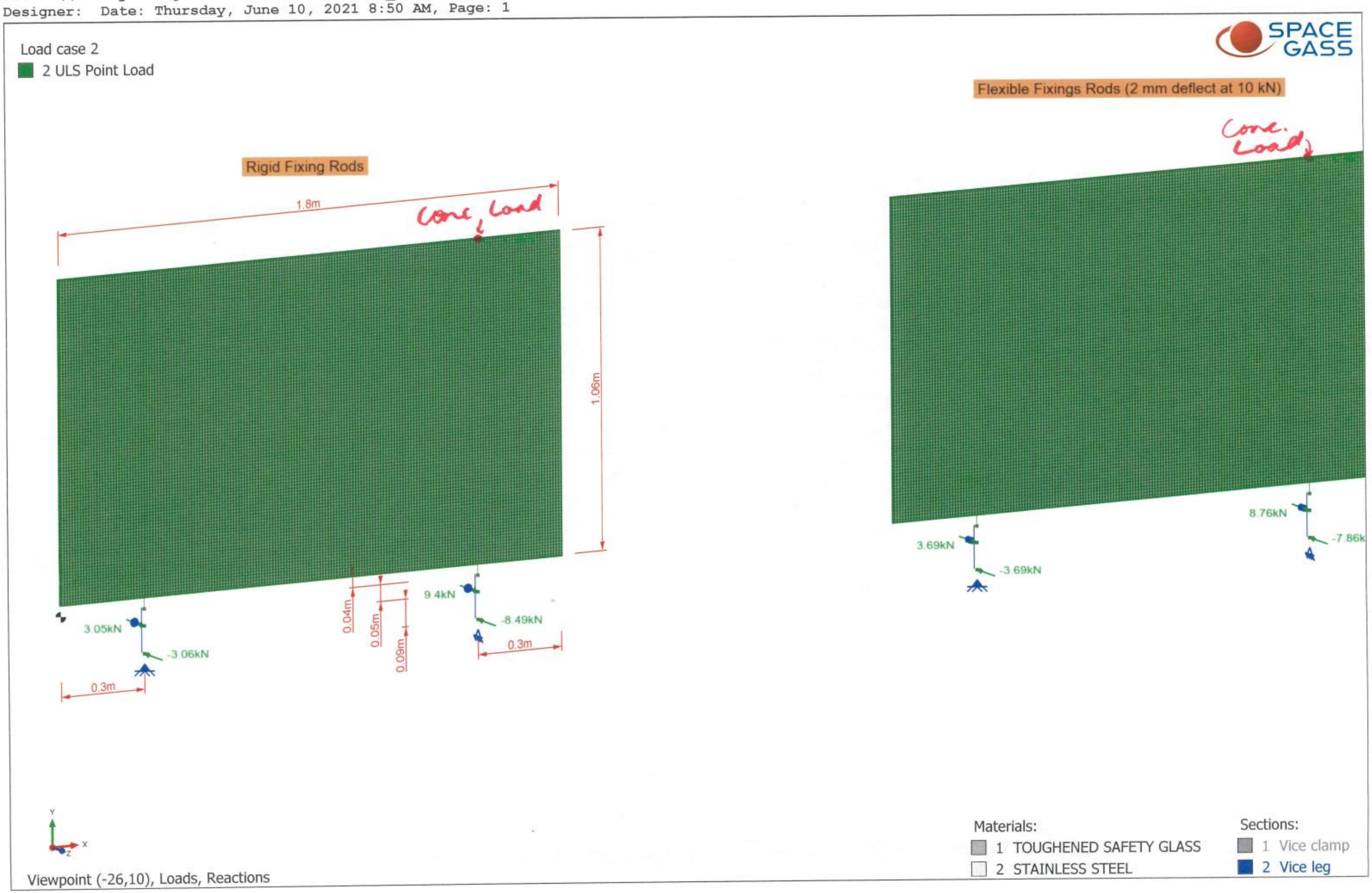


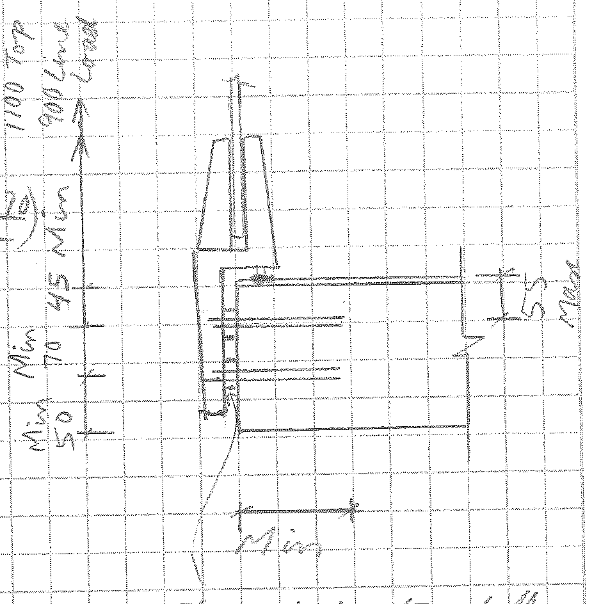
8

AB01 – Face Fixed to Concrete

Actual actions vary
Hilti Analysis is for typ. case below
Line load case governs
as found centres

$M^* = \overbrace{1.5 \times 0.75 \times 1.825/2}^{P^*} \times (0.9 + 0.055 + 0.070)$
$= 1.02$ kNm taken @ centre of two fixings
per vice

$P^* = 1.5 \times 0.75 \times 1.825/2 = 1.03$ kN
per vice



Max down load:

G: $1.8/2 \times 1.1 \times 0.012 \times 25 = 0.30$ kN

Q: $1.8/2 \times 0.75 = 0.68$ kN

$[1.2G, 1.5Q] = 1.2 \times 0.30 + 1.5 \times 0.68 = 1.38$ kN ↓ /vice

Not simultaneous with horiz. load on barrier

Refer to Hilti Software output

$N_f^* = \cancel{14.31}$ kN if baseplate bearing onto conc.
see below
but usually have threaded nut standoff

$\Rightarrow N_f^* = 1.03 \times (0.9 + 0.055 + 0.070)/0.070 = 15.08$ kN

Capacity ϕN_{urc} = 15.08 kN marginal for some applications

To improve ⇒ increase embedment to 150mm

⇒ USE:

2 M10 Stainless steel threaded rod anchors Hilti HIT-RE 500 V3 injection mortar Min 45 mm top edge distance, max 55 Min " bottom " " Min 150 mm into concrete (min 20MPa) Install to Hilti spec. in clean dry hole

Company:	Airey Consultants Ltd.	Page:	1
Specifier:	MJ	Project:	GV 12mm TSG Barrier
Address:	Level 1, Fountain Lane North, Botany Town Centre, AK	Fastening Point:	
Phone I Fax:	09 534 6523 |	Date:	2/08/2019
E-Mail:	mamoonj@aireys.co.nz		

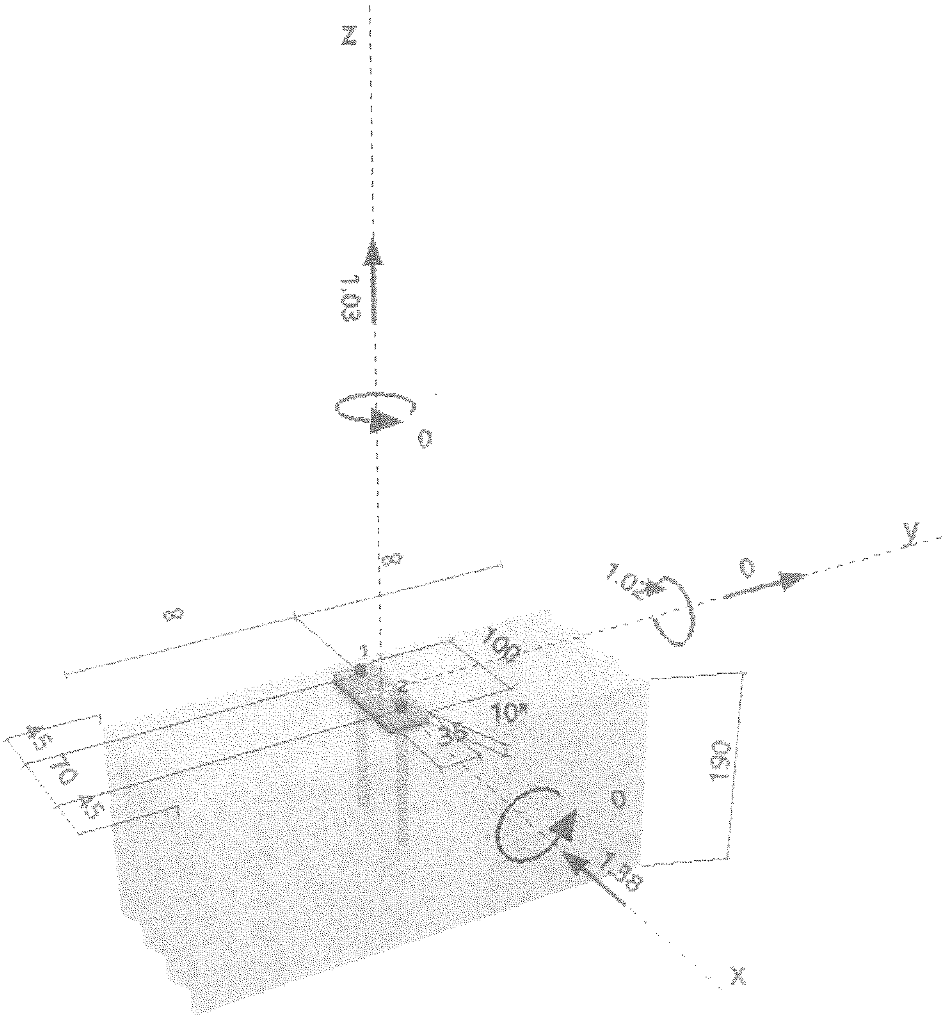
Specifier's comments:

1 Input data

Anchor type and size:	**HIT-RE 500 V3 + HIT-V-R M10**
Effective embedment depth:	$h_{ef,act}$ = 120 mm ($h_{ef,limit}$ = - mm)
Material:	A4
Approval No.:	ETA 16/0143
Issued I Valid:	12/07/2017 | -
Proof:	Design method ETAG BOND (EOTA TR 029)
Stand-off installation:	e_b = 0 mm (no stand-off); t = 10 mm
Baseplate:	l_x x l_y x t = 100 mm x 35 mm x 10 mm; (Recommended plate thickness: not calculated
Profile:	no profile
Base material:	uncracked concrete, C20/25, $f_{c,cube}$ = 25.00 N/mm^2; h = 190 mm, Temp. short/long: 0/0 °C
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	No reinforcement or Reinforcement spacing >= 150 mm (any Ø) or >= 100 mm (Ø <= 10 mm)
	no longitudinal edge reinforcement

R - The anchor calculation is based on a rigid baseplate assumption.

Geometry [mm] & Loading [kN, kNm]



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Company:	Airey Consultants Ltd.	Page:	2
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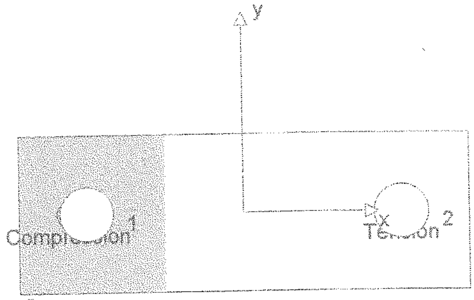
Address:	Level 1, Fountain Lane North, Botany Town Centre, AK	Fastening Point:	
Phone I Fax:	09 534 6523 |	Date:	2/08/2019
E-Mail:	mamoonj@aireys.co.nz		

2 Load case/Resulting anchor forces

Load case: Design loads



Anchor reactions [kN]
Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	0.000	0.690	-0.690	0.000
2	14.311	0.690	-0.690	0.000

see hand calc 15.08 kN

max. concrete compressive strain:	0.77 [‰]
max. concrete compressive stress:	23.18 [N/mm²]
resulting tension force in (x/y)=(35/0):	14.311 [kN]
resulting compression force in (x/y)=(-39/0):	13.281 [kN]

conc. bearing
but we have stand-offs

Anchor forces are calculated based on the assumption of a rigid baseplate.

3 Tension load (EOTA TR 029, Section 5.2.2)

	Load [kN]	Capacity [kN]	Utilisation β_N [%]	Status
Steel failure*	14.311	21.711	66	OK
Combined pullout-concrete cone failure**	14.311	18.389	78	OK
Concrete cone failure**	14.311	15.244	94	OK
Splitting failure**	14.311	15.085	95	OK

* most unfavourable anchor **anchor group (anchors in tension)

3.1 Steel failure

$N_{Rk,s}$ [kN]	$\gamma_{M,s}$	$N_{Rd,s}$ [kN]	N_{Sd} [kN]
40.600	1.870	21.711	14.311

3.2 Combined pullout-concrete cone failure

$A_{p,N}$ [mm²]	$A^0_{p,N}$ [mm²]	$\tau_{Rk,ucr,25}$ [N/mm²]	$s_{cr,Np}$ [mm]	$c_{cr,Np}$ [mm]	c_{min} [mm]
49,574	96,000	18.00	310	155	45

ψ_c	$\tau_{Rk,ucr}$ [N/mm²]	k	$\psi^0_{g,Np}$	$\psi_{g,Np}$
1.000	18.00	3.200	1.000	1.000

$e_{c1,N}$ [mm]	$\psi_{ec1,Np}$	$e_{c2,N}$ [mm]	$\psi_{ec2,Np}$	$\psi_{s,Np}$	$\psi_{re,Np}$
0	1.000	0	1.000	0.787	1.000

$N^0_{Rk,p}$ [kN]	$N_{Rk,p}$ [kN]	$\gamma_{M,p}$	$N_{Rd,p}$ [kN]	N_{Sd} [kN]
67.858	27.583	1.500	18.389	14.311

3.3 Concrete cone failure

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]
57,600	129,600	180	360

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$
0	1.000	0	1.000	0.775	1.000

k_1	$N^0_{Rk,c}$ [kN]	$\gamma_{M,c}$	$N_{Rd,c}$ [kN]	N_{Sd} [kN]
10.100	66.384	1.500	15.244	14.311

3.4 Splitting failure

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$c_{cr,sp}$ [mm]	$s_{cr,sp}$ [mm]	$\psi_{h,sp}$
67,200	176,400	210	420	1.171

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$	k_1
0	1.000	0	1.000	0.764	1.000	10.100

$N^0_{Rk,c}$ [kN]	$\gamma_{M,sp}$	$N_{Rd,sp}$ [kN]	N_{Sd} [kN]
66.384	1.500	15.085	14.311

Company:	Airey Consultants Ltd.	Page:	3
Specifier:	MJ	Project:	GV 12mm TSG Barrier
Address:	Level 1, Fountain Lane North, Botany Town Centre, AK	Fastening Point:	
Phone I Fax:	09 534 6523 |	Date:	2/08/2019
E-Mail:	mamoonj@aireys.co.nz		

4 Shear load (EOTA TR 029, Section 5.2.3)

	Load [kN]	Capacity [kN]	Utilisation β_V [%]	Status
Steel failure (without lever arm)*	0.690	13.013	6	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout failure**	1.380	30.487	5	OK
Concrete edge failure in direction x-**	1.380	5.013	28	OK

* most unfavourable anchor **anchor group (relevant anchors)

4.1 Steel failure (without lever arm)

$V_{Rk,s}$ [kN]	$\gamma_{M,s}$	$V_{Rd,s}$ [kN]	V_{Sd} [kN]
20.300	1.560	13.013	0.690

4.2 Pryout failure (concrete cone relevant)

$A_{c,N}$ [mm^2]	$A^0_{c,N}$ [mm^2]	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]	k-factor	k_1
57,600	129,600	180	360	2.000	10.100

$e_{c1,V}$ [mm]	$\psi_{ec1,N}$	$e_{c2,V}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$
0	1.000	0	1.000	0.775	1.000

$N^0_{Rk,c}$ [kN]	$\gamma_{M,c,p}$	$V_{Rd,cp}$ [kN]	V_{Sd} [kN]
66.384	1.500	30.487	1.380

4.3 Concrete edge failure in direction x-

h_{ef} [mm]	d_{nom} [mm]	k_1	α	β
120	10.0	2.400	0.163	0.074

c_1 [mm]	$A_{c,V}$ [mm^2]	$A^0_{c,V}$ [mm^2]
45	9,113	9,113

$\psi_{s,V}$	$\psi_{h,V}$	$\psi_{\alpha,V}$	$e_{c,V}$ [mm]	$\psi_{ec,V}$	$\psi_{re,V}$
1.000	1.000	1.000	0	1.000	1.000

$V^0_{Rk,c}$ [kN]	$\gamma_{M,c}$	$V_{Rd,c}$ [kN]	V_{Sd} [kN]
7.520	1.500	5.013	1.380

5 Combined tension and shear loads (EOTA TR 029, Section 5.2.4)

Max V* & M* not simultaneous ⇒ OK

β_N	β_V	α	Utilisation $\beta_{N,V}$ [%]	Status
0.949	0.275	1.000	102	not recommended

$(\beta_N + \beta_V) / 1.2 \leq 1.0$

6 Displacements (highest loaded anchor)

Short term loading:

N_{Sk}	=	10.601 [kN]	δ_N	=	0.141 [mm]
V_{Sk}	=	0.511 [kN]	δ_V	=	0.031 [mm]
			δ_{NV}	=	0.144 [mm]

Long term loading:

N_{Sk}	=	10.601 [kN]	δ_N	=	0.309 [mm]
V_{Sk}	=	0.511 [kN]	δ_V	=	0.041 [mm]
			δ_{NV}	=	0.312 [mm]

Comments: Tension displacements are valid with half of the required installation torque moment for uncracked concrete! Shear displacements are valid without friction between the concrete and the baseplate! The gap due to the drilled hole and clearance hole tolerances are not included in this calculation!

The acceptable anchor displacements depend on the fastened construction and must be defined by the designer!

Company: Airey Consultants Ltd.
Specifier: MJ
Address: Level 1, Fountain Lane North, Botany Town Centre, AK
Phone I Fax: 09 534 6523 |
E-Mail: mamoonj@aireys.co.nz

7 Warnings

- The anchor design methods in PROFIS Anchor require rigid baseplates per current regulations (ETAG 001/Annex C, EOTA TR029, etc.). This means load re-distribution on the anchors due to elastic deformations of the baseplate are not considered - the baseplate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Anchor calculates the minimum required baseplate thickness with FEM to limit the stress of the baseplate based on the assumptions explained above. The proof if the rigid baseplate assumption is valid is not carried out by PROFIS Anchor. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Checking the transfer of loads into the base material is required in accordance with EOTA TR 029, Section 7!
- The design is only valid if the clearance hole in the fixture is not larger than the value given in Table 4.1 of EOTA TR029! For larger diameters of the clearance hole see Chapter 1.1. of EOTA TR029!
- The accessory list in this report is for the information of the user only. In any case, the instructions for use provided with the product have to be followed to ensure a proper installation.
- Characteristic bond resistances depend on short- and long-term temperatures.
- Please contact Hilti to check feasibility of HIT-V rod supply.
- Edge reinforcement is not required to avoid splitting failure

Fastening does not meet the design criteria!

www.hilti.com.au
Company: Airey Consultants Ltd.
Specifier: MJ
Address: Level 1, Fountain Lane North, Botany Town Centre, AK
Phone I Fax: 09 534 6523 |
E-Mail: mamoonj@aireys.co.nz

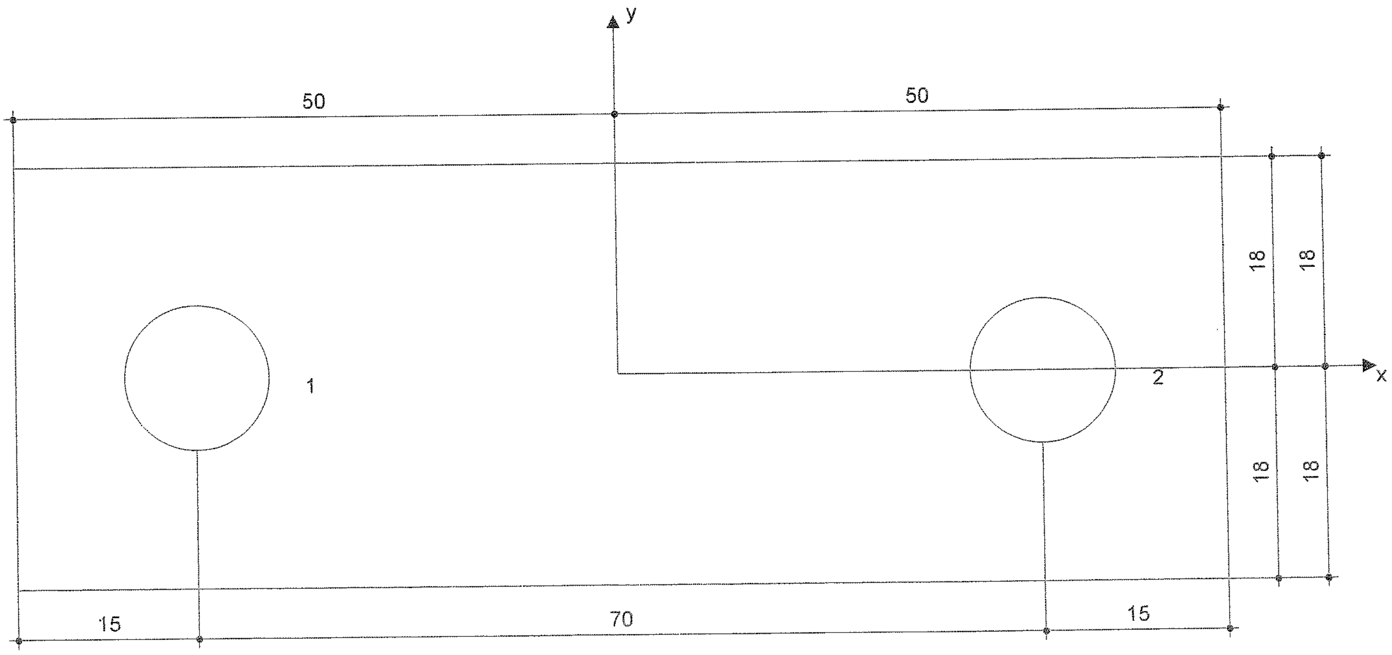
8 Installation data

Baseplate, steel: -
Profile: no profile
Hole diameter in the fixture: d_f = 12 mm
Plate thickness (input): 10 mm
Recommended plate thickness: not calculated
Drilling method: Hammer drilled
Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required

Anchor type and size: HIT-RE 500 V3 + HIT-V-R M10
Installation torque: 0.020 kNm
Hole diameter in the base material: 12 mm
Hole depth in the base material: 120 mm
Minimum thickness of the base material: 150 mm

8.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Compressed air with required accessories to blow from the bottom of the hole • Proper diameter wire brush	• Dispenser including cassette and mixer • Torque wrench



Coordinates Anchor [mm]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-35	0	45	115	-	-
2	35	0	115	45	-	-

Company:	Airey Consultants Ltd.	Page:	6
Specifier:	MJ	Project:	GV 12mm TSG Barrier
Address:	Level 1, Fountain Lane North, Botany Town Centre, AK	Fastening Point:	
Phone I Fax:	09 534 6523 |	Date:	2/08/2019
E-Mail:	mamoonj@aireys.co.nz		

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- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

AIREY CONSULTANTS LTD.

Consulting Civil and Structural Engineers

Takapuna Botany Queenstown

CLIENT:

JOB:

CALCS. BY: PHONE:

SHEET No.: 16

JOB No.:

DATE:

AB 02, 03, 05, 06, 07

* Side Fixed Architectural Bracket fixing calcs in spreadsheet

AIREY CONSULTANTS LTD.

Consulting Civil and Structural Engineers

Takapuna Botany Queenstown

CLIENT:

JOB:

CALCS. BY: PHONE:

SHEET No.: 17

JOB No.:

DATE:

DF01 Glass Vice Top Fixed Clamp to Concrete

Analysis is for case below but M* will vary

$V^* = 1.03\,kN$

$M^* = 1.5 \times 0.75 \times 1.875/2 \times 0.9 = 0.92\,kNm$ / Vice
↳ Varies

N_T^* anchors = 0.92/0.057 = 16.21 kN
↳ Varies ↳ Varies

See Hilti output Capacity min = 16.17 kN for anchor in tension

∴ Moment Capacity = 0.057 × 16.2 = 0.92 kNm

⇒ USE:

2M10 S.S. Threaded Rods
set in Hilti HIT-RE V500 epoxy
to Hilti instructions in clean/dry hole
Min 60 mm from edge
Min 150 " from ends
Min 57 " spacing
Min 90 mm embedment into 130mm min. conc.
Concrete min 20MPa, uncracked

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Company:	Airey Consultants Ltd.	Page:	1
Specifier:	MJ	Project:	GV 12mm TSG Barrier
Address:	Level 1, Fountain Lane North, Botany Town Centre, AK	Fastening Point:	
Phone I Fax:	09 534 6523 |	Date:	25/07/2019
E-Mail:	mamoonj@aireys.co.nz		

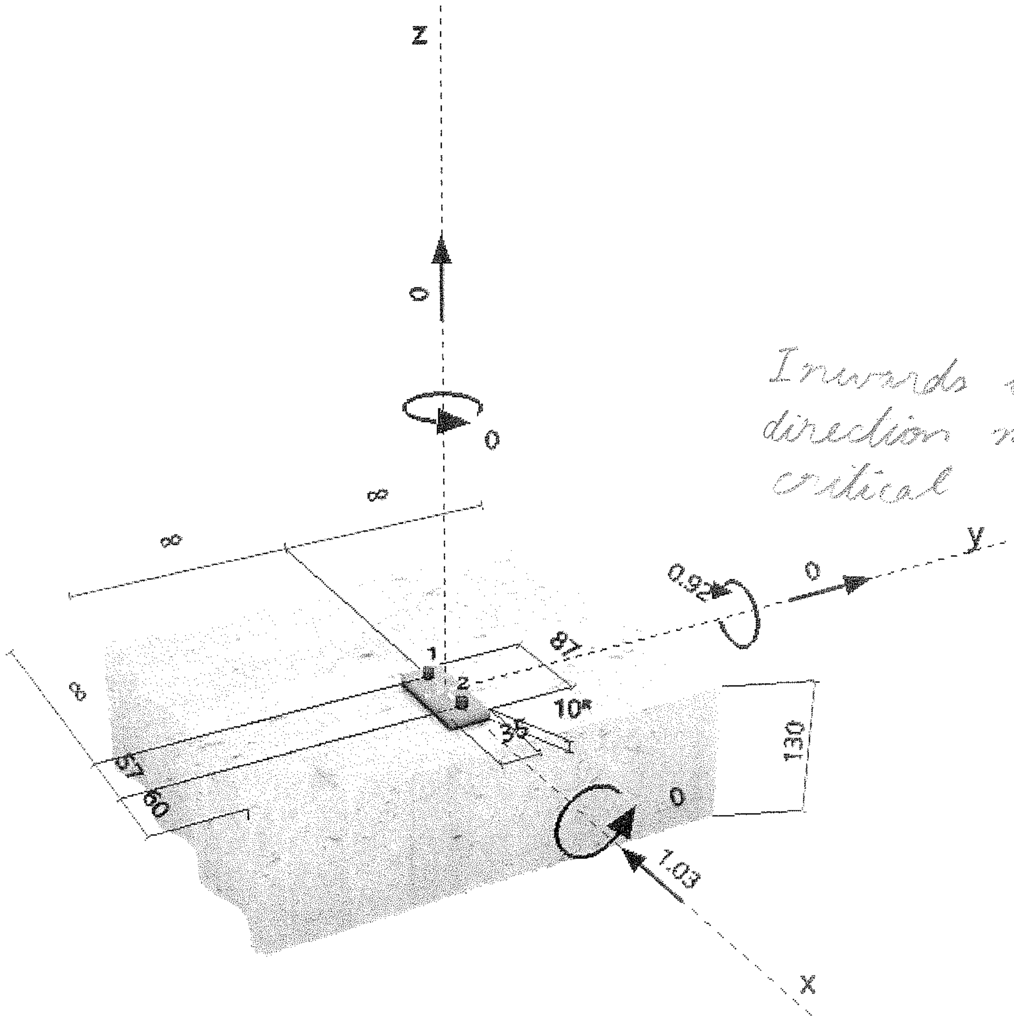
Specifier's comments:

1 Input data

Anchor type and size:	**HIT-RE 500 V3 + HIT-V-R M10**
Effective embedment depth:	$h_{ef,act}$ = 90 mm ($h_{ef,limit}$ = - mm)
Material:	A4
Approval No.:	ETA 16/0143
Issued I Valid:	12/07/2017 | -
Proof:	Design method ETAG BOND (EOTA TR 029)
Stand-off installation:	e_b = 0 mm (no stand-off); t = 10 mm
Baseplate:	l_x x l_y x t = 87 mm x 35 mm x 10 mm; (Recommended plate thickness: not calculated
Profile:	no profile
Base material:	uncracked concrete, C20/25, $f_{c,cube}$ = 25.00 N/mm^2; h = 130 mm, Temp. short/long: 0/0 °C
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	No reinforcement or Reinforcement spacing >= 150 mm (any Ø) or >= 100 mm (Ø <= 10 mm) no longitudinal edge reinforcement

R - The anchor calculation is based on a rigid baseplate assumption.

Geometry [mm] & Loading [kN, kNm]



Inwards load direction more critical

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E-Mail:	mamoonj@aireys.co.nz		

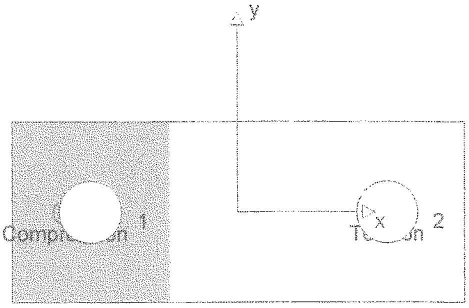
2 Load case/Resulting anchor forces

Load case: Design loads

Anchor reactions [kN]
Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	0.000	0.515	-0.515	0.000
2	14.866	0.515	-0.515	0.000

Hand calc - 16.21 kN



max. concrete compressive strain: 0.93 [‰]
max. concrete compressive stress: 27.99 [N/mm²]
resulting tension force in (x/y)=(29/0): 14.866 [kN]
resulting compression force in (x/y)=(-33/0): 14.866 [kN]

Anchor forces are calculated based on the assumption of a rigid baseplate.

3 Tension load (EOTA TR 029, Section 5.2.2)

	Load [kN]	Capacity [kN]	Utilisation β_N [%]	Status
Steel failure*	14.866	21.711	69	OK
Combined pullout-concrete cone failure**	14.866	20.420	73	OK
Concrete cone failure**	14.866	17.300	86	OK
Splitting failure**	14.866	16.171	92	OK

* most unfavourable anchor **anchor group (anchors in tension)

3.1 Steel failure

$N_{Rk,s}$ [kN]	$\gamma_{M,s}$	$N_{Rd,s}$ [kN]	N_{Sd} [kN]
40.600	1.870	21.711	14.866

3.2 Combined pullout-concrete cone failure

$A_{p,N}$ [mm²]	$A^0_{p,N}$ [mm²]	$\tau_{Rk,ucr,25}$ [N/mm²]	$s_{cr,Np}$ [mm]	$c_{cr,Np}$ [mm]	c_{min} [mm]
52,650	72,900	18.00	270	135	60

ψ_c	$\tau_{Rk,ucr}$ [N/mm²]	k	$\psi^0_{g,Np}$	$\psi_{g,Np}$
1.000	18.00	3.200	1.000	1.000

$e_{c1,N}$ [mm]	$\psi_{ec1,Np}$	$e_{c2,N}$ [mm]	$\psi_{ec2,Np}$	$\psi_{s,Np}$	$\psi_{re,Np}$
0	1.000	0	1.000	0.833	1.000

$N^0_{Rk,p}$ [kN]	$N_{Rk,p}$ [kN]	$\gamma_{M,p}$	$N_{Rd,p}$ [kN]	N_{Sd} [kN]
50.894	30.631	1.500	20.420	14.866

3.3 Concrete cone failure

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]
52,650	72,900	135	270

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$
0	1.000	0	1.000	0.833	1.000

k_1	$N^0_{Rk,c}$ [kN]	$\gamma_{M,c}$	$N_{Rd,c}$ [kN]	N_{Sd} [kN]
10.100	43.118	1.500	17.300	14.866

3.4 Splitting failure

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$c_{cr,sp}$ [mm]	$s_{cr,sp}$ [mm]	$\psi_{h,sp}$
86,400	129,600	180	360	1.055

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$	k_1
0	1.000	0	1.000	0.800	1.000	10.100

$N^0_{Rk,c}$ [kN]	$\gamma_{M,sp}$	$N_{Rd,sp}$ [kN]	N_{Sd} [kN]
43.118	1.500	16.171	14.866

4 Shear load (EOTA TR 029, Section 5.2.3)

	Load [kN]	Capacity [kN]	Utilisation β_V [%]	Status
Steel failure (without lever arm)*	0.515	13.013	4	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout failure**	1.030	44.715	3	OK
Concrete edge failure in direction **	N/A	N/A	N/A	N/A

* most unfavourable anchor **anchor group (relevant anchors)

4.1 Steel failure (without lever arm)

$V_{Rk,s}$ [kN]	$\gamma_{M,s}$	$V_{Rd,s}$ [kN]	V_{Sd} [kN]
20.300	1.560	13.013	0.515

4.2 Pryout failure (concrete cone relevant)

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]	k-factor	k_1
68,040	72,900	135	270	2.000	10.100

$e_{c1,V}$ [mm]	$\psi_{ec1,N}$	$e_{c2,V}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$
0	1.000	0	1.000	0.833	1.000

$N^0_{Rk,c}$ [kN]	$\gamma_{M,c,p}$	$V_{Rd,cp}$ [kN]	V_{Sd} [kN]
43.118	1.500	44.715	1.030

5 Combined tension and shear loads (EOTA TR 029, Section 5.2.4)

β_N	β_V	α	Utilisation $\beta_{N,V}$ [%]	Status
0.919	0.040	1.000	80	OK

$(\beta_N + \beta_V) / 1.2 \leq 1.0$

6 Displacements (highest loaded anchor)

Short term loading:

N_{Sk} = 11.012 [kN] δ_N = 0.195 [mm]

V_{Sk} = 0.381 [kN] δ_V = 0.023 [mm]

δ_{NV} = 0.196 [mm]

Long term loading:

N_{Sk} = 11.012 [kN] δ_N = 0.428 [mm]

V_{Sk} = 0.381 [kN] δ_V = 0.031 [mm]

δ_{NV} = 0.429 [mm]

Comments: Tension displacements are valid with half of the required installation torque moment for uncracked concrete! Shear displacements are valid without friction between the concrete and the baseplate! The gap due to the drilled hole and clearance hole tolerances are not included in this calculation!

The acceptable anchor displacements depend on the fastened construction and must be defined by the designer!

Company:	Airey Consultants Ltd.	Page:	4
Specifier:	MJ	Project:	GV 12mm TSG Barrier
Address:	Level 1, Fountain Lane North, Botany Town Centre, AK	Fastening Point:	
Phone I Fax:	09 534 6523 |	Date:	25/07/2019
E-Mail:	mamoonj@aireys.co.nz		

7 Warnings

- The anchor design methods in PROFIS Anchor require rigid baseplates per current regulations (ETAG 001/Annex C, EOTA TR029, etc.). This means load re-distribution on the anchors due to elastic deformations of the baseplate are not considered - the baseplate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Anchor calculates the minimum required baseplate thickness with FEM to limit the stress of the baseplate based on the assumptions explained above. The proof if the rigid baseplate assumption is valid is not carried out by PROFIS Anchor. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Checking the transfer of loads into the base material is required in accordance with EOTA TR 029, Section 7!
- The design is only valid if the clearance hole in the fixture is not larger than the value given in Table 4.1 of EOTA TR029! For larger diameters of the clearance hole see Chapter 1.1. of EOTA TR029!
- The accessory list in this report is for the information of the user only. In any case, the instructions for use provided with the product have to be followed to ensure a proper installation.
- Characteristic bond resistances depend on short- and long-term temperatures.
- Please contact Hilti to check feasibility of HIT-V rod supply.
- Edge reinforcement is not required to avoid splitting failure

Fastening meets the design criteria!

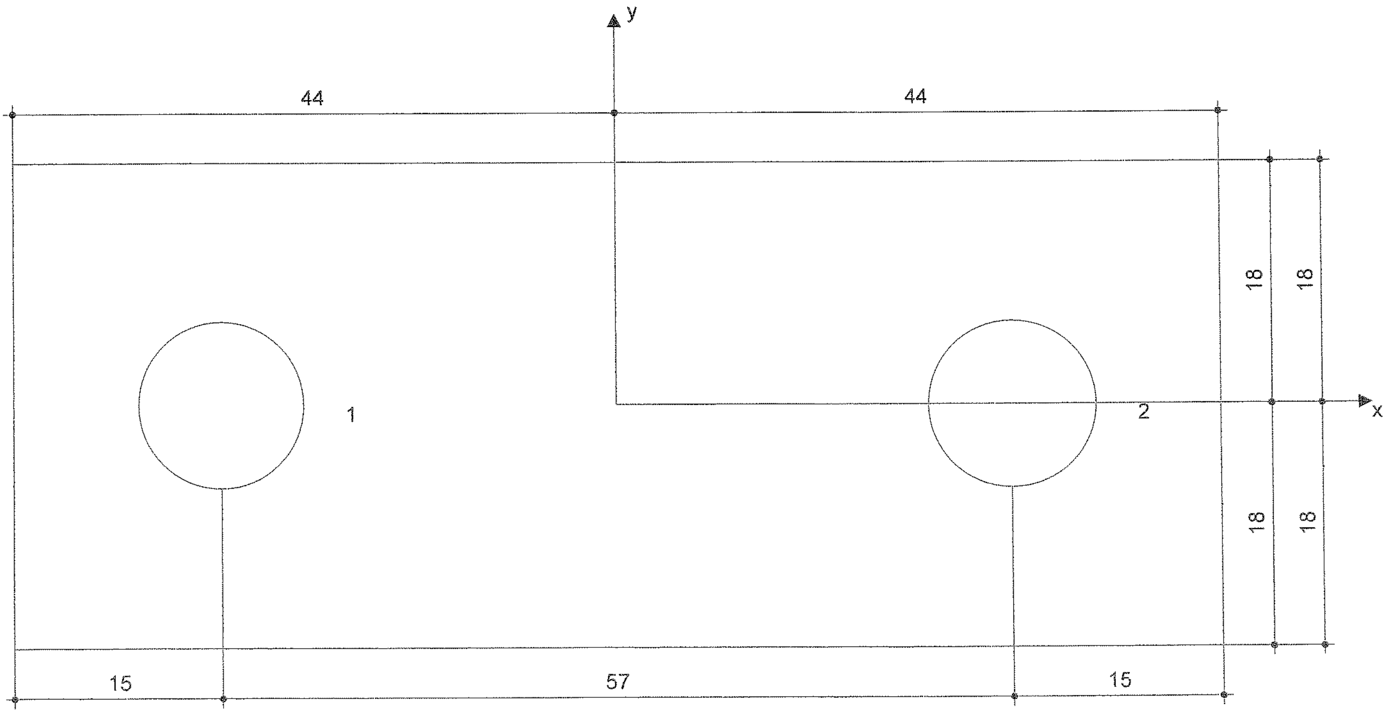
8 Installation data

Baseplate, steel: -
Profile: no profile
Hole diameter in the fixture: d_f = 12 mm
Plate thickness (input): 10 mm
Recommended plate thickness: not calculated
Drilling method: Hammer drilled
Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required

Anchor type and size: HIT-RE 500 V3 + HIT-V-R M10
Installation torque: 0.020 kNm
Hole diameter in the base material: 12 mm
Hole depth in the base material: 90 mm
Minimum thickness of the base material: 120 mm

8.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Compressed air with required accessories to blow from the bottom of the hole • Proper diameter wire brush	• Dispenser including cassette and mixer • Torque wrench



Coordinates Anchor [mm]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-29	0	-	117	-	-
2	29	0	-	60	-	-

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Company:	Airey Consultants Ltd.	Page:	6
Specifier:	MJ	Project:	GV 12mm TSG Barrier
Address:	Level 1, Fountain Lane North, Botany Town Centre, AK	Fastening Point:	
Phone I Fax:	09 534 6523 |	Date:	25/07/2019
E-Mail:	mamoonj@aireys.co.nz		

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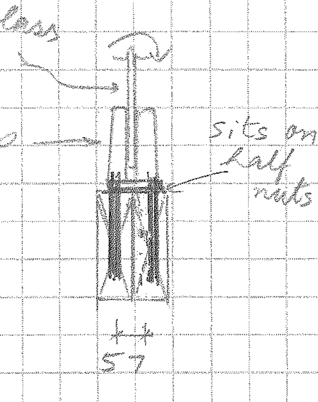
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

DF02 - Top Fixed Timber - Wet

Withdrawal Capacity of epoxied M10 rods into wet timber = 117 N/mm
(Refer to test report

2 M10 Epoxied threaded rods
wet timber with Hilti HIT-RE 500 V3
130 mm penetration exc. tip
57 " spacing Vice/Clamp



Moment Capacity $0.117 \times 130 \times 0.057 = 0.87$ kNm

SB02 – Top Fixed Timber – wet

Same as DF02 but also has coach screws on wing 'side' bracket – ref detail

Epoxied rods only

Same as DF02 i.e. $\phi M_n = 0.87$ kNm

Coach Screws only

Lever arm ~ 50 mm

M10 Coach screw in wet timber capacity = 89 N/mm

2 M10 Coach Screws into wet timber
90 mm penetration
50 " spacing

$\phi M_n = 0.089 \times 90 \times 0.050 = 0.40$ kNm

Combined

Due to close proximity of coach screws & epoxied rods

Accept 100% capacity of epoxied rods 0.87
50% " " coach screws $0.5 \times 0.40 =$ 0.20
1.07 kNm

SB-F - Same as SB02 but fixed into 90 deep timber
wet timber

Coach Screws only

Withdrawal capacity from tests in wet timber = 89 N/mm

2 M10 Coach Screws
85mm (exc. tip) into wet timber
50 mm spacing

Moment Capacity = 0.089 × 85 × 0.050 = 0.38 kNm

Epoxied Threaded Rod only

Withdrawal cap from tests in wet timber = 117 N/mm

2 M10 Epoxied Rods Hilti HIT-RE 500 V3
80 mm into wet timber
57 " spacing

Moment Cap = 0.117 × 80 × 0.057 = 0.53 kNm

Combined

Due to close proximity ≤ 5 dia ...

Accept 50% capacity of coach screws 0.5×0.38 0.19
100% " of epoxied rods ∴ 0.53
0.72
kNm

Refer to extract from tests done for Glass Vice Floating Timber deck system which included S-bracket - see next pages

⇒ Design Capacity = 1.00 kNm

Extract from tests for Glass Vice Floating Timber Deck inc S-bracket

AIREY CONSULTANTS LTD.

Job:	**Floating Timber Deck**	Test:	1 to 4
Address:	**NZ**	Engineer:	MJ
Client:	**Glass Vice Products Ltd.**	Job num:	180297-04
Test Date:	**20/05/2021**	Calc. date:	2/06/2021

APPENDIX B2 - DESIGN CAPACITY FROM TESTS - PAIR JV88 ON 90x45 JOISTS @400CRS WITH 2/90X45 BOUNDARY JOIST

Scenario

Joist:	90x45 SG8	Boundary Joist:	2/90x45 SG8
Bracket:	Pair JV88 on two joists with 4/14G x 125 mm Type 17 SS screws into triple boundary joist and 5/14G x 25 mm Type 17 SS screws into joist per brac		
Load height above joists	1040	mm	
Joist depth	90	mm	
Depth to pivot	20	mm	(from U/S of joists)
Load height above pivot	1110	mm	

Test conducted by: Glass Vice Products Ltd.

Test observed by: Airey Consultants Ltd. Engineer: MJ

See test report for further information

	Test load at 100 mm deflection [1] x (kN)	x - Avx	(x-Avx)^2	Moisture			
Test 1	1.51	0.03	0.00	16%	kwet	0.8	applied to all
Test 2	1.51	0.03	0.00	14%			
Test 3	1.72	0.24	0.06	13%			
Test 4	1.47	-0.01	0.00	14%			
	1.55		0.06		SD =	0.114	sample standard dev
	Avx		Σ(x-Avx)^2				

Coefficient of Variation = SD/Avx	0.073		
kt	1.22	AS/NZS 1170.0 2002 Table B1	
Minimum test load (kg)	1.47	kN	
Design capacity = min test load / kt	~~1.21~~	kN	total

but kwet for coachscrews is 0.7 not 0.8 assumed above. ⇒

Des. capacity $= \frac{0.7}{0.8} \times 1.21$
$= 1.06$ kN

Load height above top of joist = 1.04 m

M design capacity = 1.04 × 1.06 = ~~1.10 kNm~~

See below

Adopt lower value

ALT. method

Test 3 & 4 resulted in yielding of S-bracket @ ~1.75 & 1.85 kN respectively after density correction for b'dry joists

NZS 3404 : 1997 Table 17.5.2 ⇒ $k_t = 1.4$

⇒ Design capacity = 1.75/1.4 × 0.8 = 1.00 kN

kwet conservative as failure not in timber fixings

⇒ M des.cap = 1.00 × 1.04 = 1.04 kNm

Quad Bracket fixing into 2/90x45 of Floating Deck

Dry Timbers — No current application

Coachscrew pullout capacity from tests = 126 N/mm - DRY
Epoxied rod " " " " = 117 N/mm - WET

Coach screws only — penetration exc. tip

Moment Capacity = 85 x (126/1000) x 0.049 x 2 = 1.05 kNm

Epoxied Rods only — embedment max

Mom cap = 80 x 117/1000 x 0.8 x 0.057 = 0.67 kNm
k wet reverse

Total

Mom cap = 1.05 + 0.67 = 1.72 kNm

Unconservative !! Because

- Epoxied rods tested central in 45 wide timbers but because of 57 spacing they won't be central
- The epoxied rods & lagscrews may interact because of spacing < 5 dia
  See also Eurocode 5 Cl. 8.7.1 which requires spacing of 7D along grain for screws in withdrawal

Accept 100% capacity of coach screws
50% " " of lag screws

⇒ Moment Capacity = 1.05 + 0.5 x 0.67 = 1.39 kNm

ADOPT

Wet Timbers

Coach screw pull-out capacity from tests = 89 N/mm - WET

Epoxied rod " " = 117 N/mm - WET

Coach Screws only

Moment capacity = 85 × 89/1000 × 2 × 0.049 = 0.74 kNm

Epoxied Rods only

Mom. cap. = 80 × 117/1000 × 0.057 = 0.53 kNm

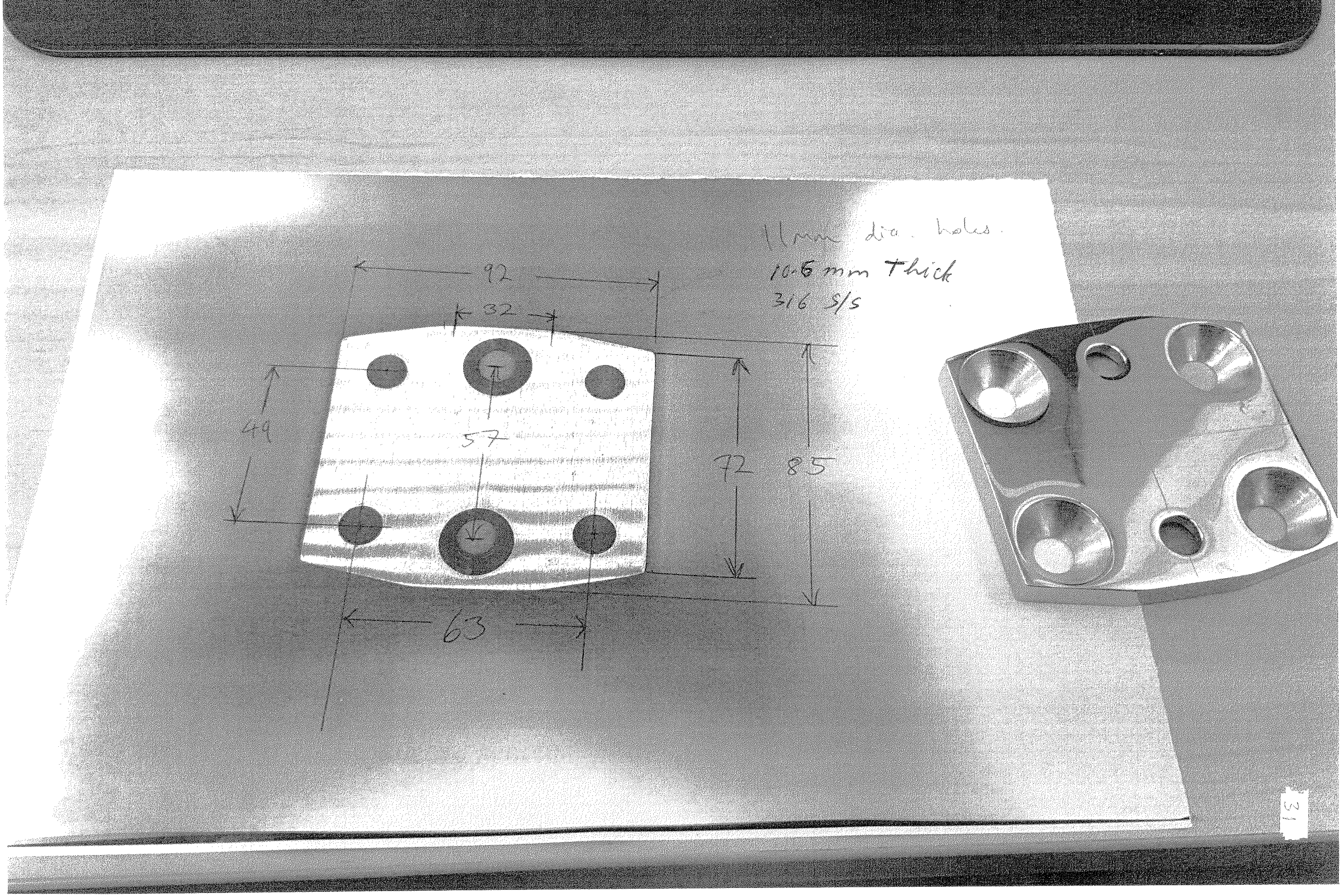
Total

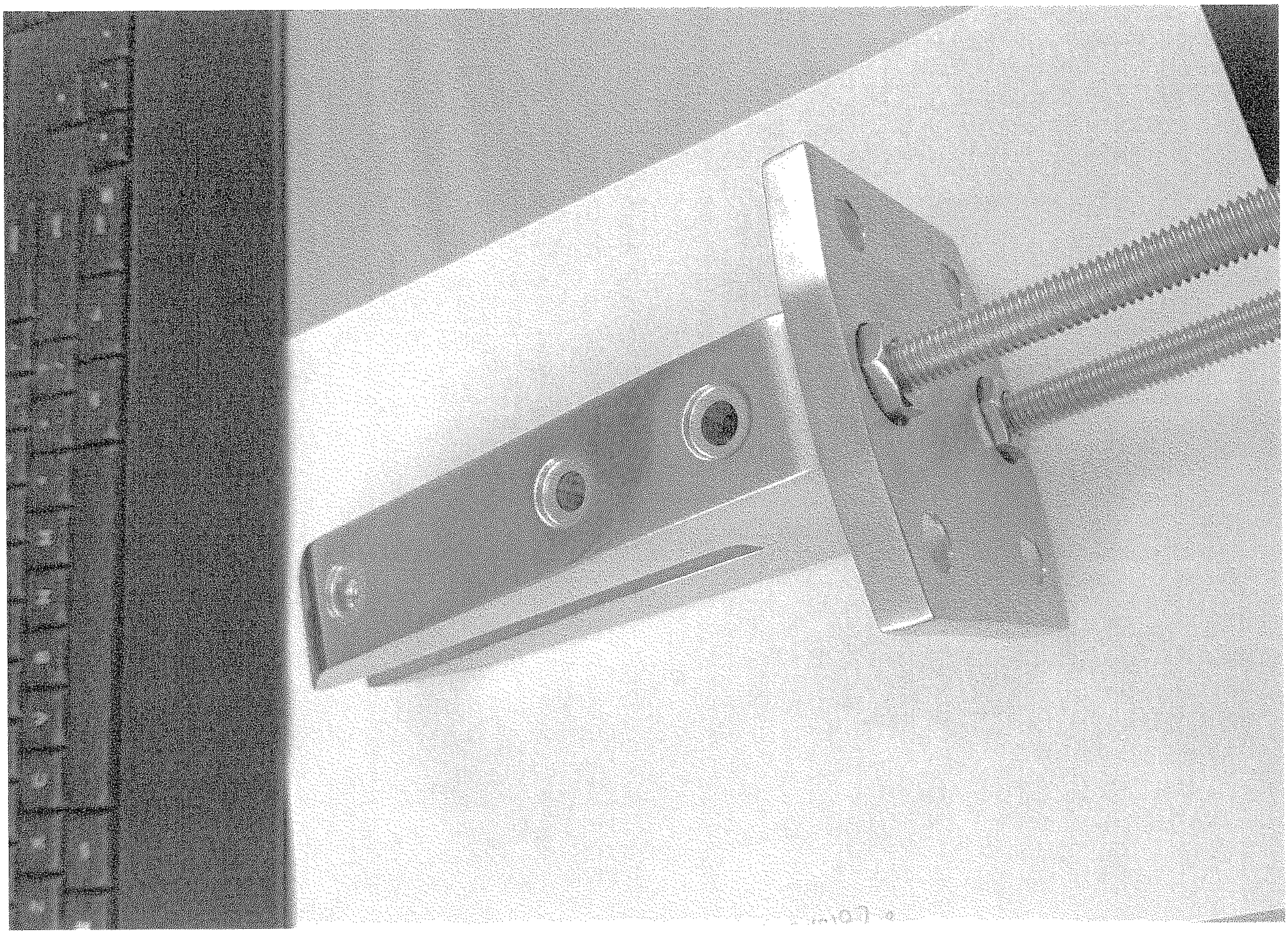
Mom. cap. = 0.74 + 0.53 = 1.27 kNm Unconservative !!
See notes on previous page

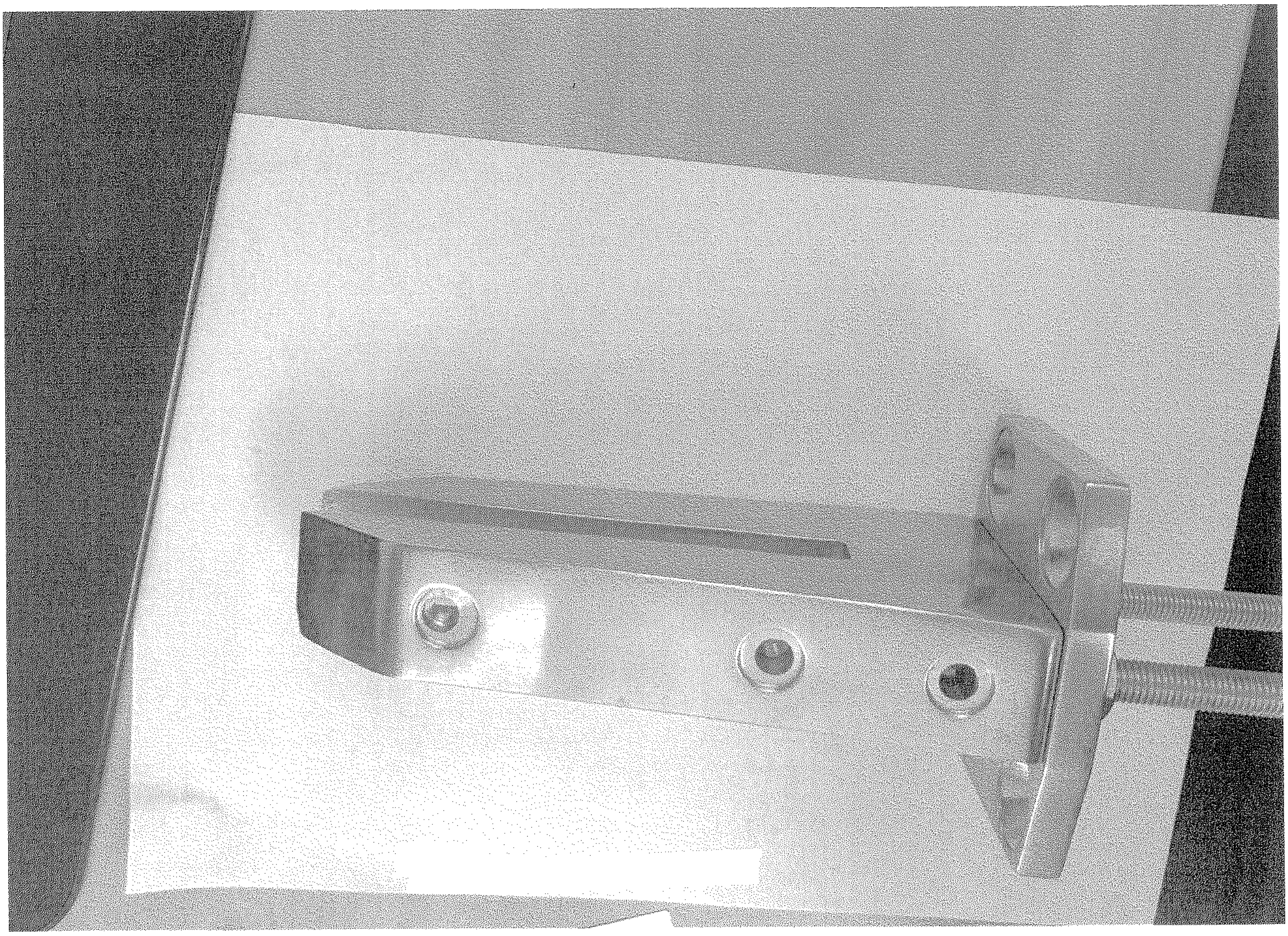
Accept 100% capacity of coach screws
+ 50% " " epoxied rods

⇒ 0.74 + 0.5 × 0.53 = 1.01 kNm ADOPT

NOTE: The Quad bracket was not used in the end because the S-bracket was adequate.


11mm dia. holes.
10.6mm Thick
316 S/S
92
32
49
57
72
85
63
31





AIREY CONSULTANTS LTD. Consulting Civil and Structural Engineers
Takapuna Botany Queenstown

CLIENT:	SHEET No.: 32a
JOB:	JOB No.:
CALCS. BY: PHONE:	DATE:

AB32 & AB35 - SIDE FIX TO STEEL

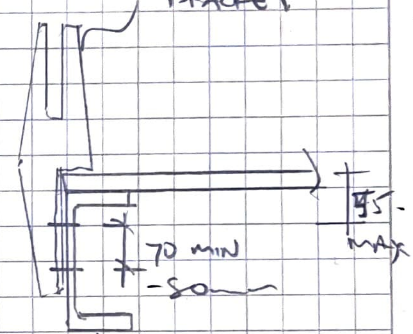
BOLT CAPACITY.

$\phi N_{tf} = \phi A_s f_{uf}$

$= 0.80 \times 58mm^2 \times 500MPa \Rightarrow 23.2 kN$

↑ M10 ↑ MIN CLASS 50 STAINLESS (A4-500)

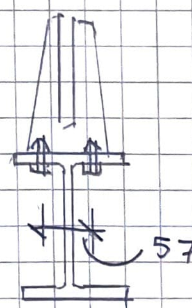
MIN BOLT SPACING. = 70mm - 80mm



DF03 - TOP FIX TO STEEL

$\phi N_{tf} = 23.2kN$ as above.

Bolt spacing = 57mm



AIREY CONSULTANTS LTD.

TEST REPORT
FOR
GLASS VICE PRODUCTS LTD.
M10 EPOXIED RODS INTO WET TIMBER

Job Number: 180297

Issue Date: 12/5/2021

Document Control Record

Document Prepared By:
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Rosedale, Auckland 0632

This report has been prepared solely for the benefit of the client. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person. This disclaimer shall apply notwithstanding that the report may be made available to other persons for an application for permission or approval or to fulfil a legal requirement.

Document Issue Schedule				
Rev. No.	Date	Description	Prepared by	Approved by
	12/5/2021	M10 epoxied rods in wet timber	MJ	DM

AIREY CONSULTANTS LTD. Consulting Civil and Structural Engineers
Pukekohe Takapuna Howick Queenstown

CLIENT:	SHEET No.: 1
JOB:	JOB No.: 180297
CALCS. BY: PHONE:	DATE: 10-2018

130 mm long 10φ SS threaded rod, HILTI-RE 500 epoxy

Test by HILTI September 2009

24 Sept 2009 Scion testing results — 18-09-2009 HILTI pullout

	Moisture	HILTI pullout	
1	34.8	21.0	
2	34.3	23.6	
3	37.0	27.0	
4	33.8	20.7	lowest
5	23.9	24.7	
6	25.3	30.1	
7	38.5	24.3	
8	38.2	28.4	
9	34.5	25.1	
10	37.5	23.6	
11	36.0	34.6	
12	24.3	29.6	

Note: two samples slightly lower than MC=25%, but significantly higher than MC=18%. Unclear as to which is which, as Scion numbered the items themselves.

From spreadsheet, sample SD = 4.15

$V_{sc} = SD/A_{vx} = \frac{4.15}{26.475} = 0.157$

from Table B1 of 1170.0:2002 : $k_t = 1.361$

$\Rightarrow$ design load $= \frac{\text{min test load}}{1.361}$

$= \frac{20.7 \text{ kN}}{1.361}$

$= 15.21$ kN

$\Rightarrow \frac{15210}{130} = \underline{117 \text{ N/mm}}$

deedprint.co.nz 41495

Test Date Sep-09

Glass Vice Test for Coefficient of Variation

Samples 290x45x300
Threaded rod HILTI HIT-RE 500 130mm embedment

Standard Deviation and Coefficient of Variation

All 12 samples included

MSG8 with 10mm dia SS screws 130mm long into timber (min MC = 23.9%)

x (kN) Test load at failure	x - Avx	(x-Avx)^2			Outcome
21	-5.48	29.98			Timber failed
23.6	-2.88	8.27			Timber failed
27	0.52	0.28			Timber failed
20.7	-5.78	33.35			Timber failed
29.7	3.22	10.40			Timber failed
30.1	3.63	13.14			Timber failed
24.3	-2.18	4.73			Timber failed
28.4	1.92	3.71			Timber failed
25.1	-1.38	1.89			Timber failed
23.6	-2.88	8.27			Timber failed
34.6	8.13	66.02			Timber failed
29.6	3.13	9.77			Timber failed
26.475 Avx		189.78 Σ(x-Avx)^2	SD =	4.15	sample standard dev

Coefficient of Variation = SD/Avx 0.157 15.7 %

From AS/NZS 1170.0 2002 kt = 1.36

N

3

SCION
Next generation biomaterials

Te Papa Tipu Innovation Park
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Private Bag 3020
Rotorua
New Zealand
Telephone: +64 7 343 5777
DDI: +64 7 343 5763
Facsimile: +64 7 343 5507
Email: douglas.gaunt@scionresearch.com

Facsimile

To:	Warwick Allen	From:	Doug Gaunt
Organisation:	Glass Vice Products Ltd	Subject:	Density & Moisture Content Results
Location:	Auckland	Date:	24 September 2009
Fax No.:	09 476 7768	No. of Pages:	1
Tel No.:	09 476 7767		

Please call +64 7 343 5763 if transmission incomplete

Warwick,

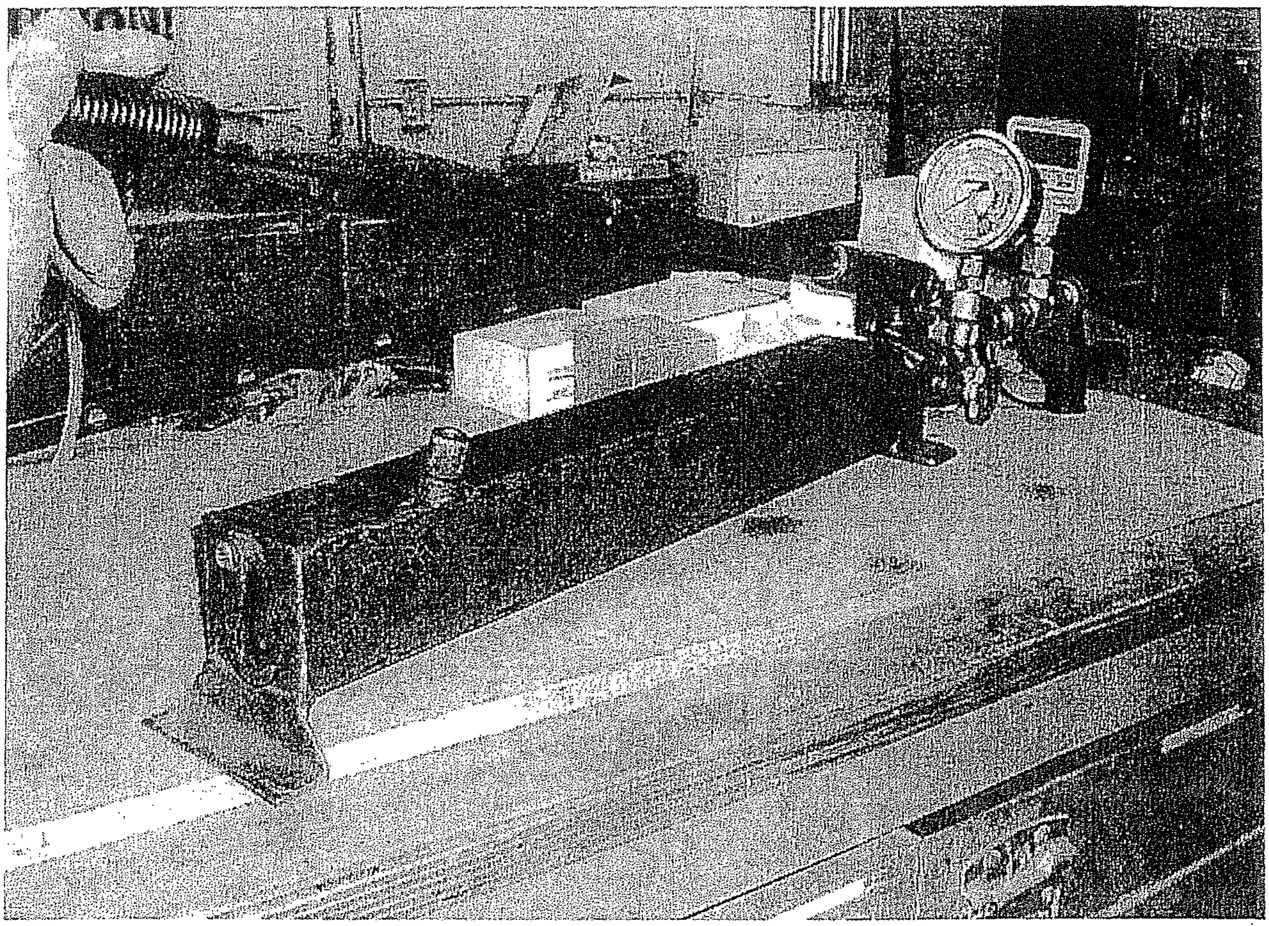
We have completed the density and moisture content testing on the samples supplied. Table 1 lists this data. The samples supplied had no reference numbers so we numbered them 1-12.

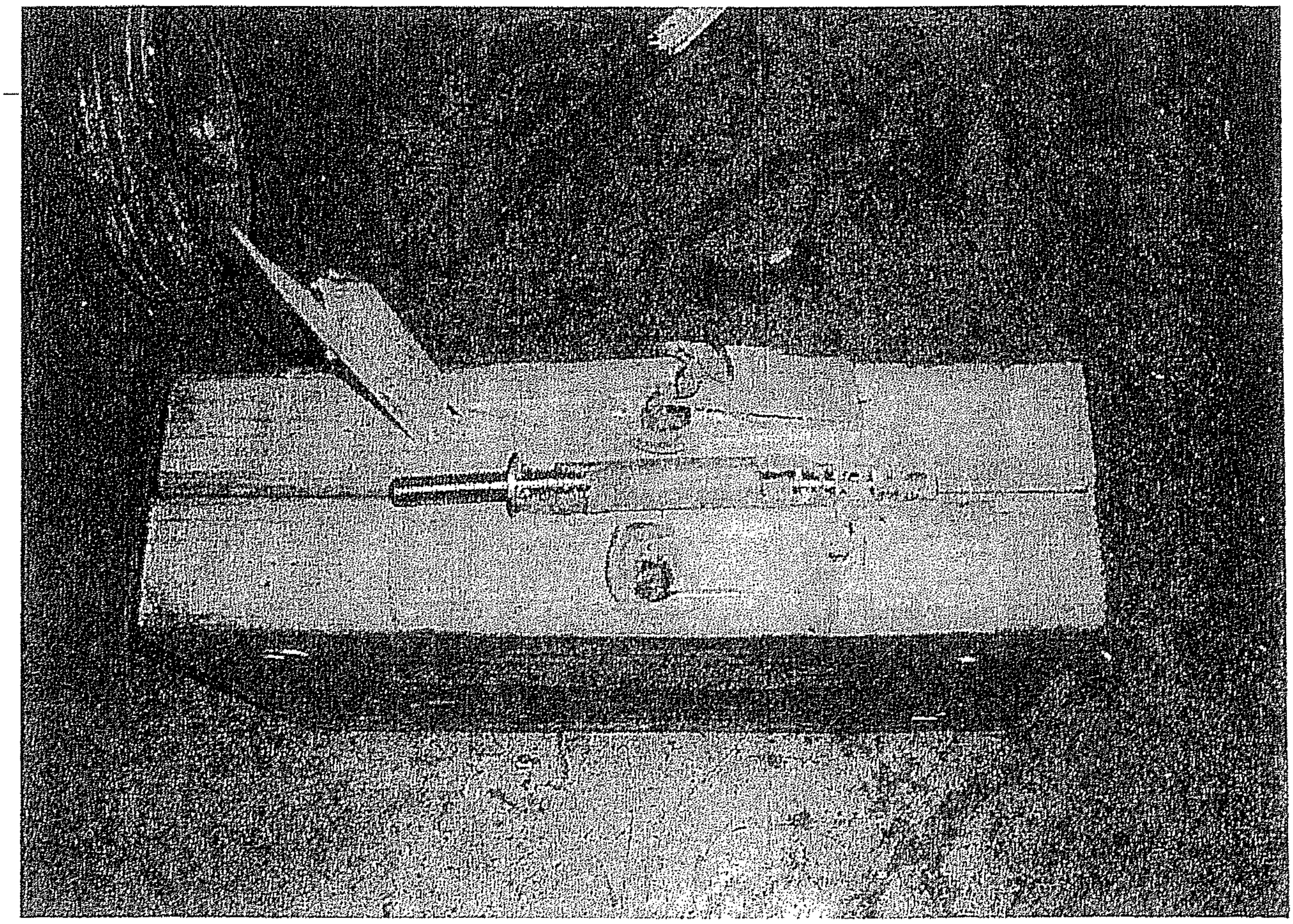
Table 1: Density and Moisture Content data.

Lab No:	Moisture Content, (%)	Density at test kg/m^3	Nominal Density kg/m^3
1	34.8	460	341
2	34.3	465	346
3	33.0	531	400
4	33.3	523	392
5	23.9 *	567	458
6	25.3	589	470
7	38.5	470	340
8	38.2	492	356
9	39.5	555	398
10	37.5	596	433
11	36.0	594	437
12	24.3 *	582	468

I trust this information meets with your approval.

Doug Gaunt





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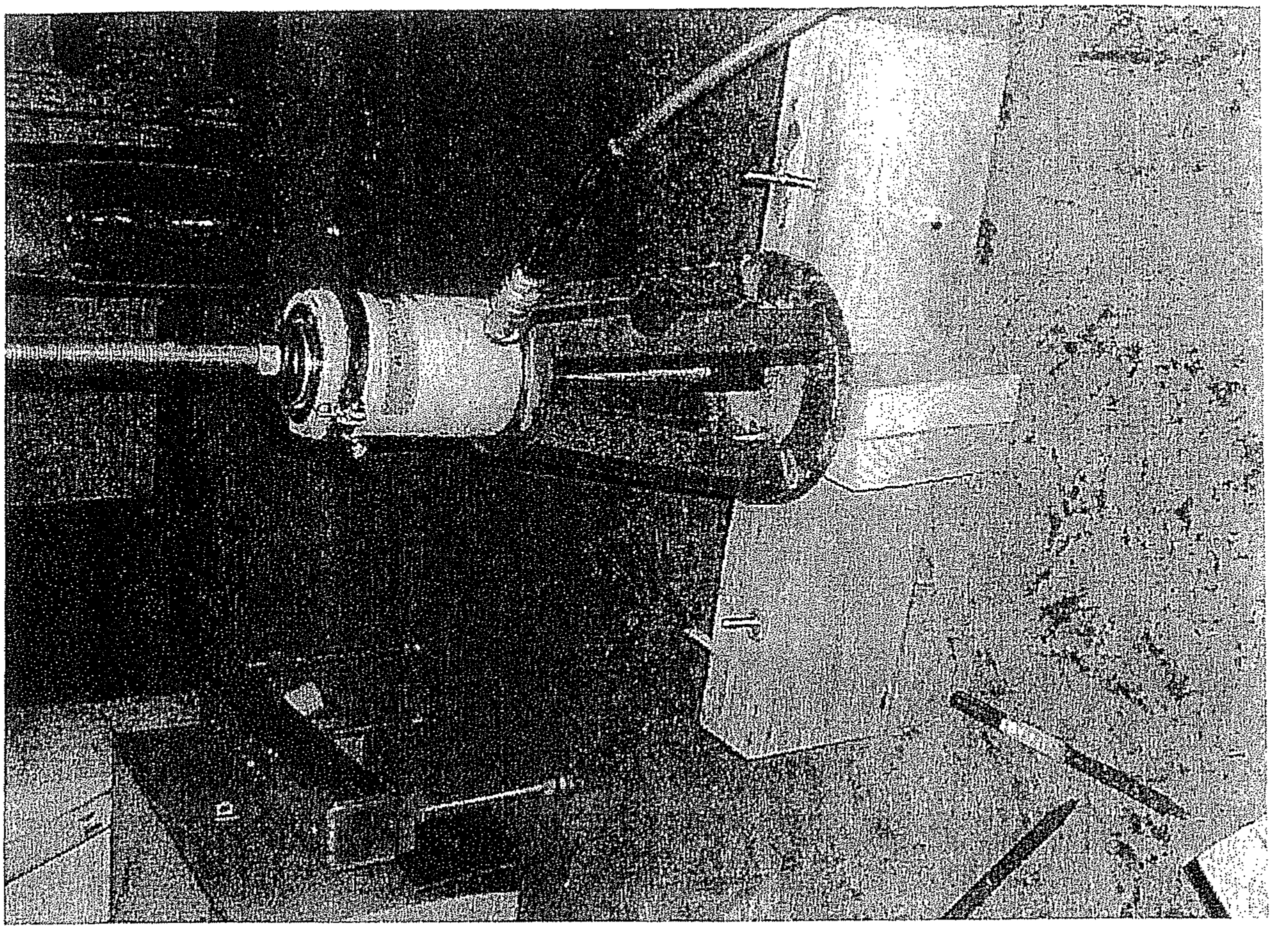

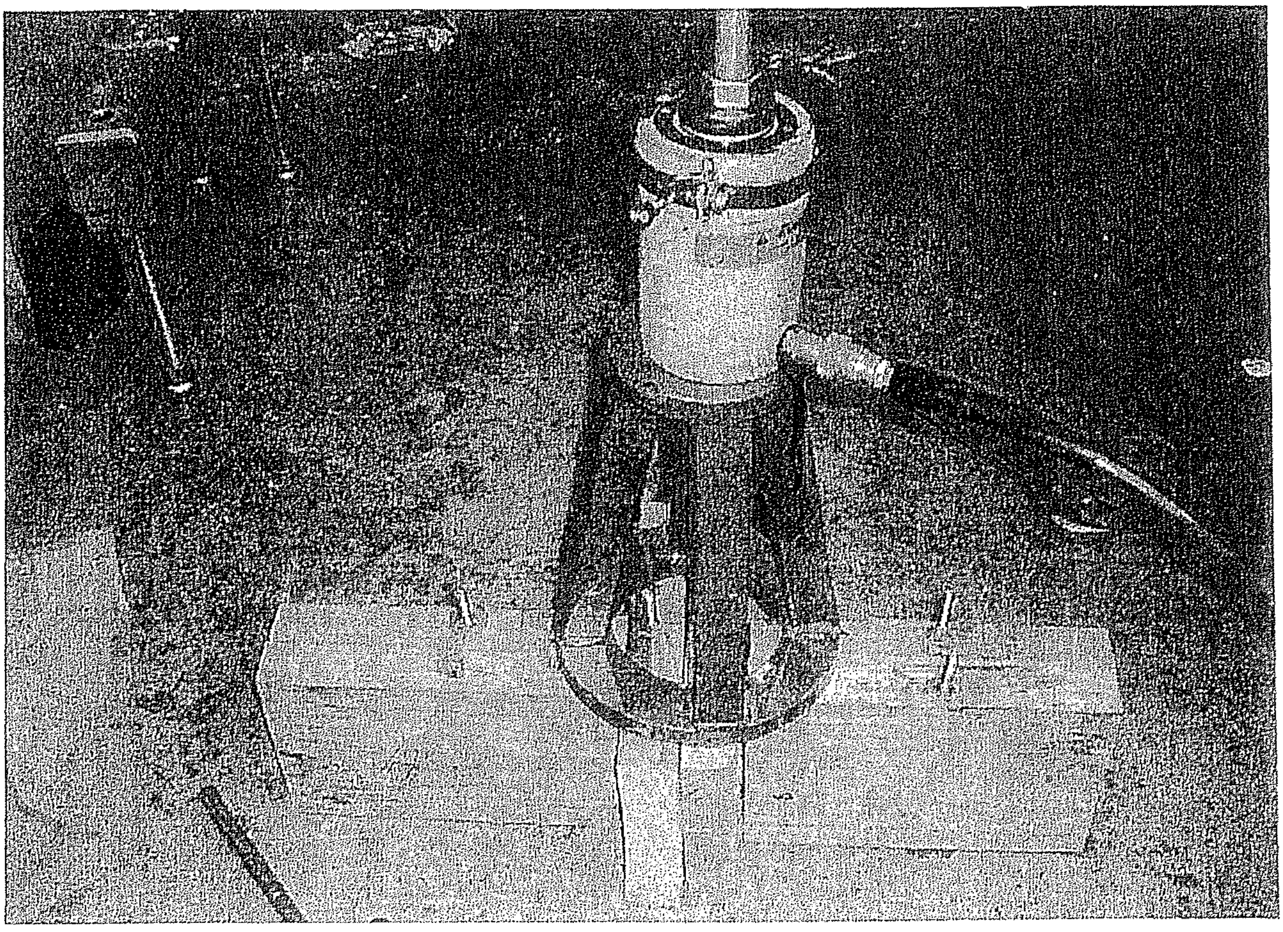

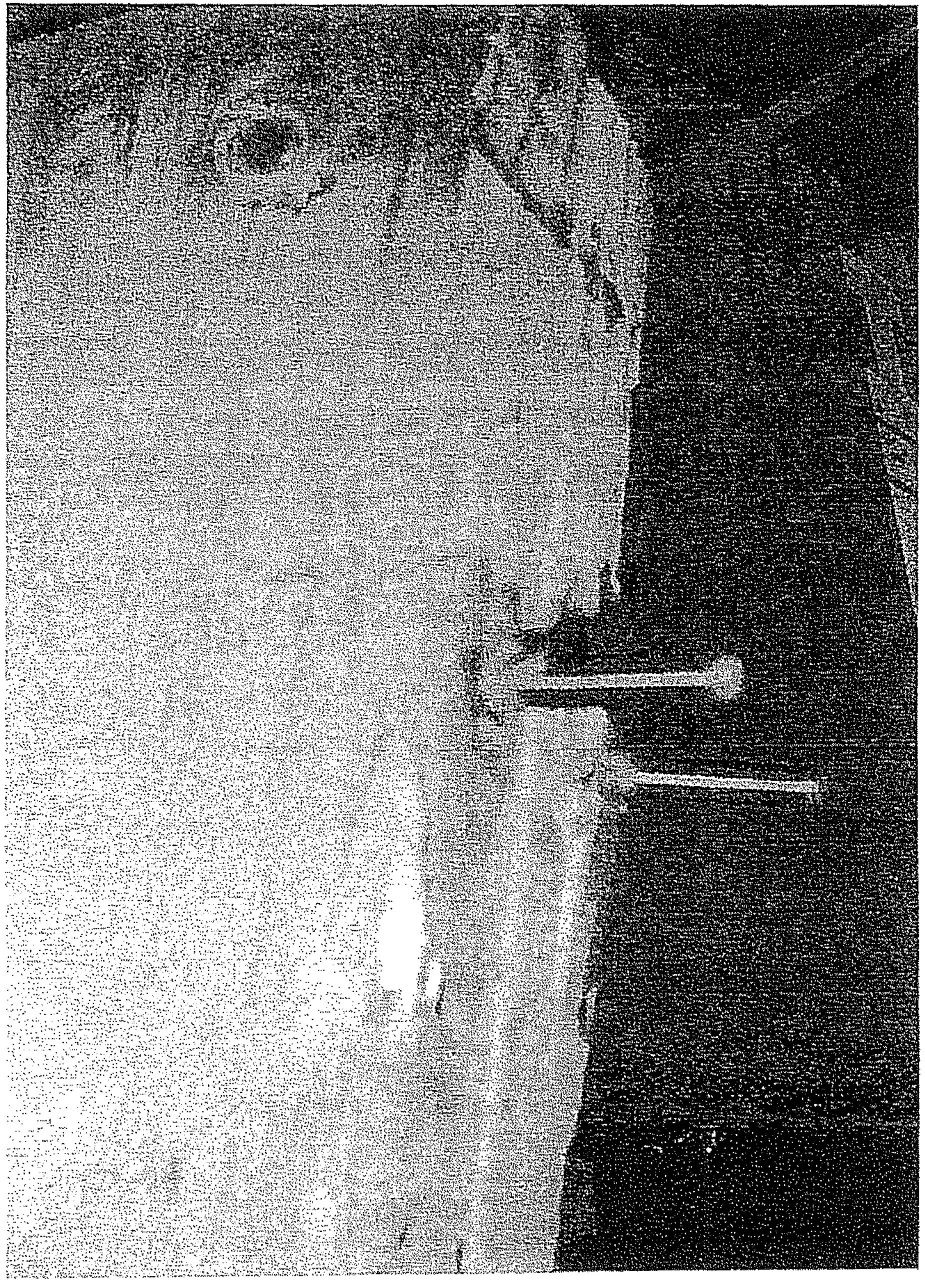

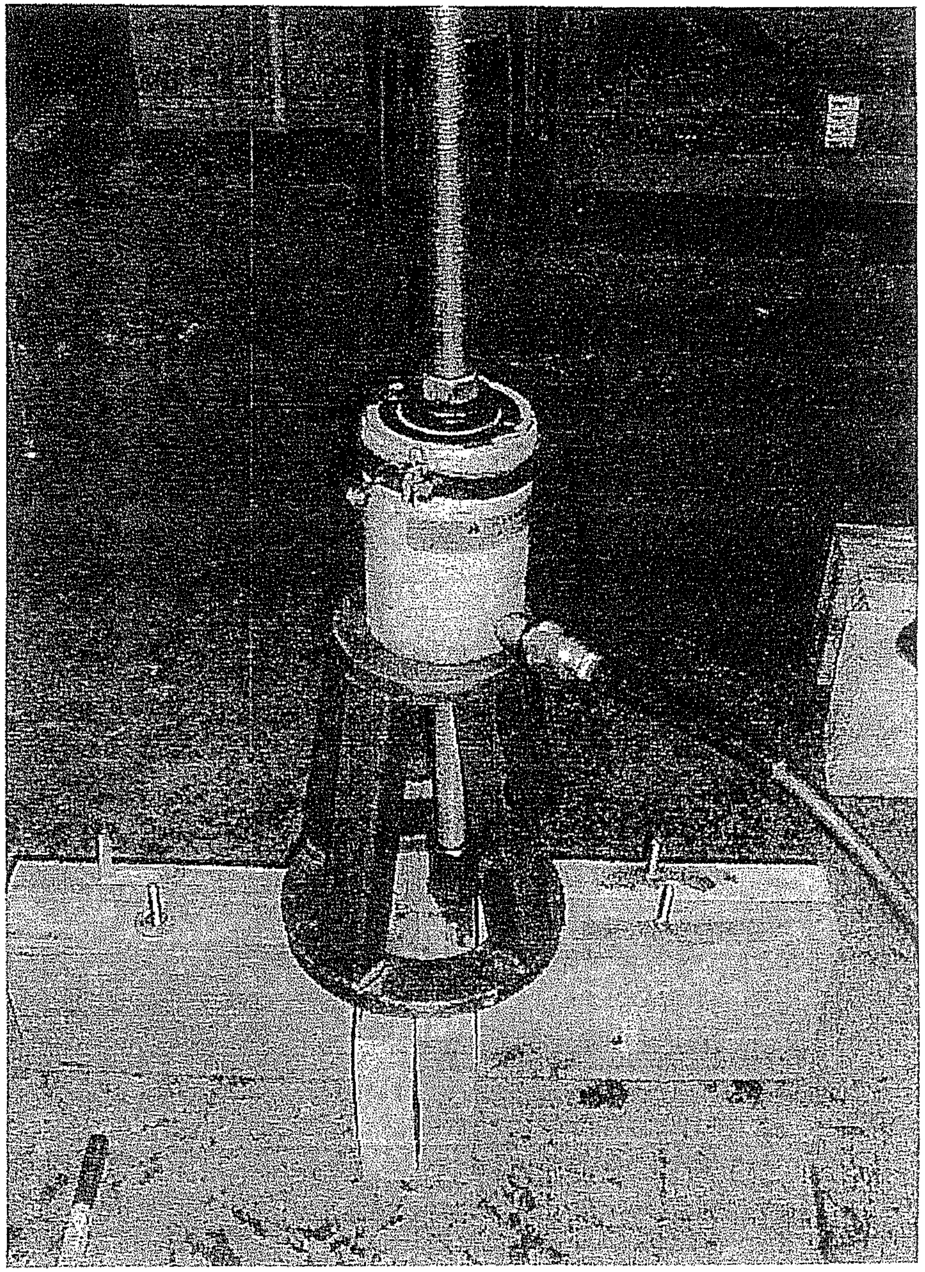

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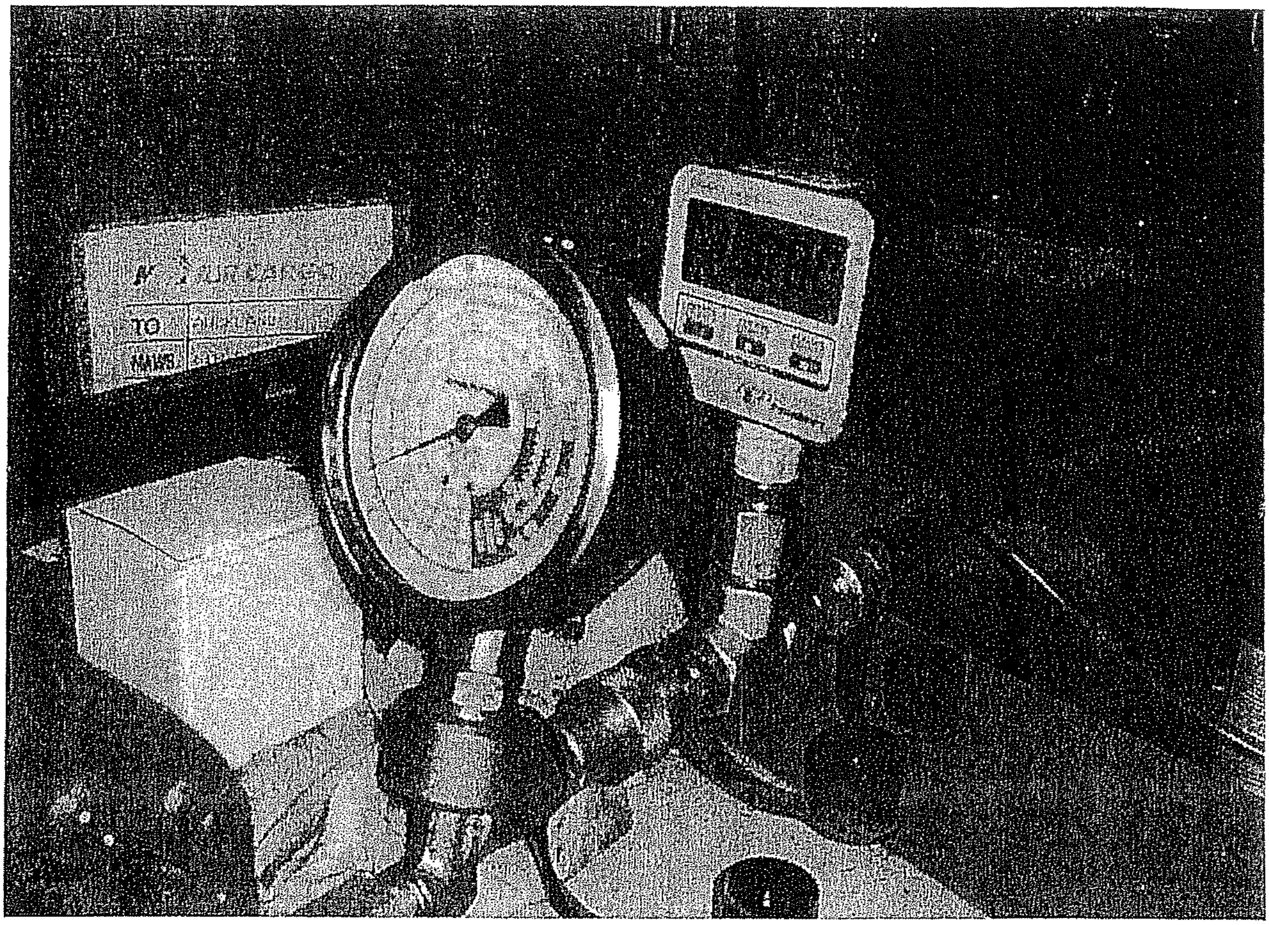

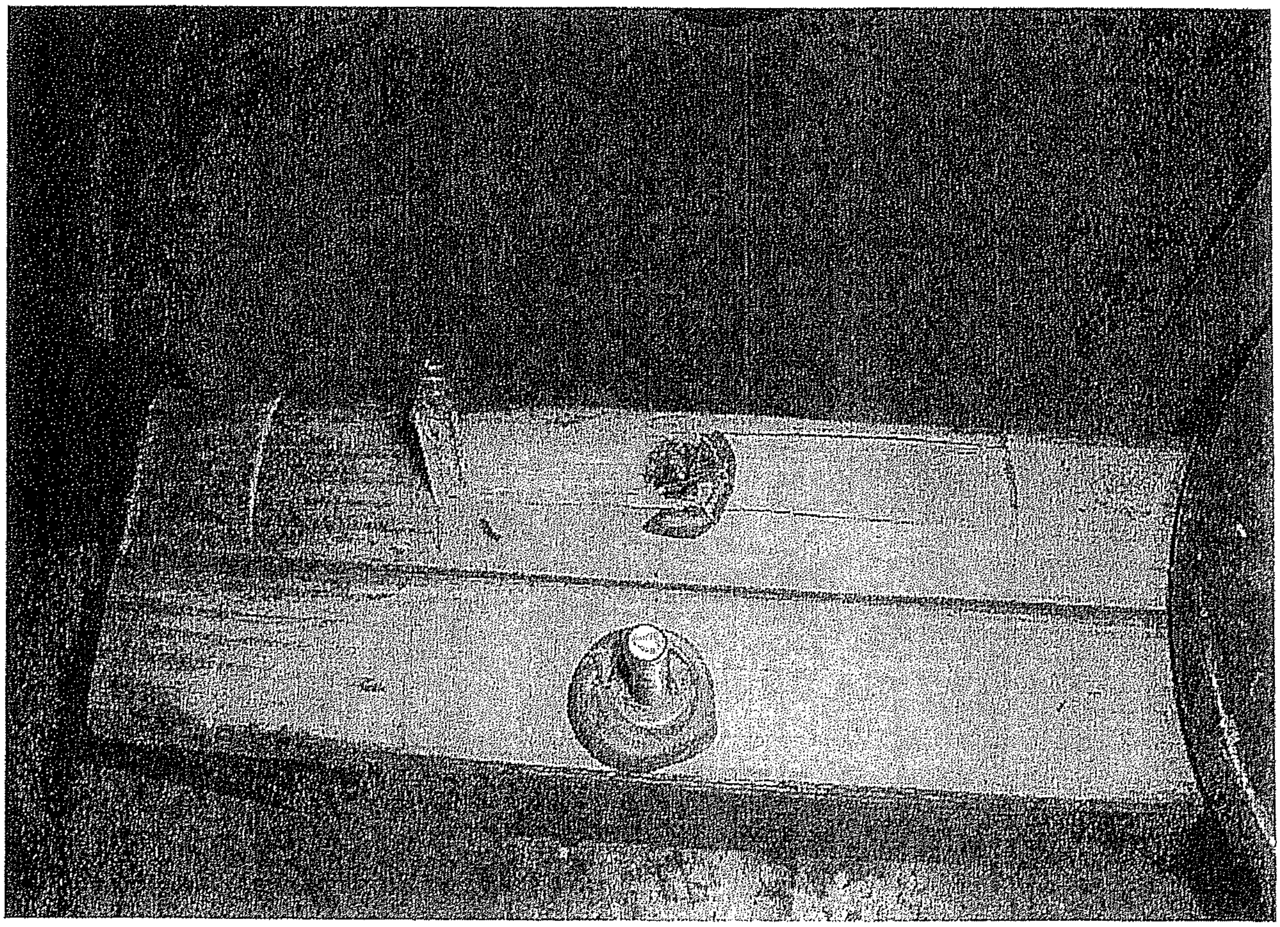

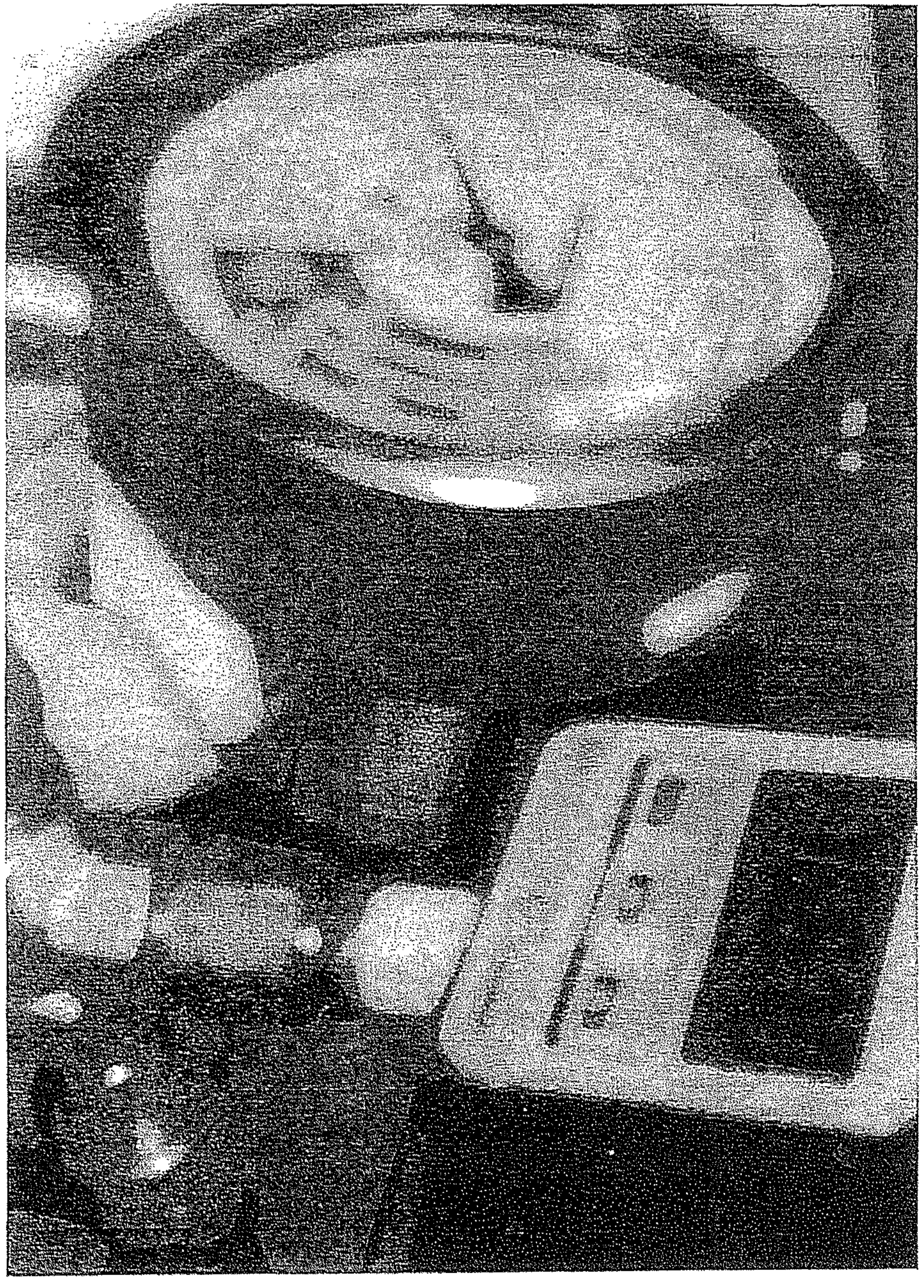

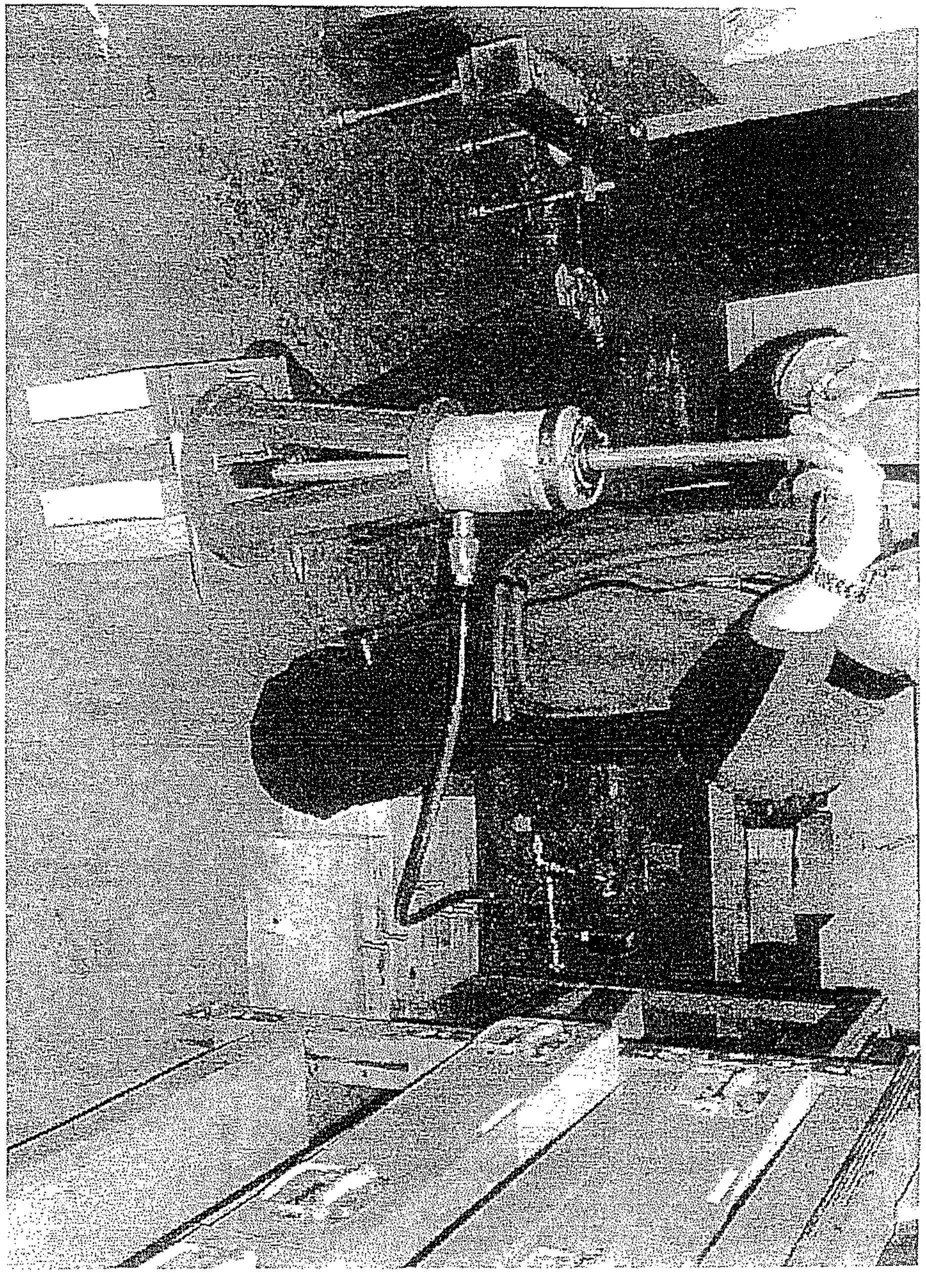

8

E.Lapish

From: "Balbuena, Gilbert" <Gilbert.Balbuena@Hilti.com>
To: <e.lapish@xtra.co.nz>
Sent: Monday, 21 September 2009 3:59 p.m.
Attach: glass vice.pdf; 20090921155212462.pdf
Subject: Anchor test report

Hi Ernest,

Attach is the test report fo the anchor testing which we have done last Friday.

Regards,

Gilbert Balbuena, MASCE, PMP
Field Engineer / Product Manager - Anchors
Hilti (New Zealand) Limited
Unit B, 750 Great South Road
PO Box 112-030, Penrose
Auckland
P 09 526 7783 **F** 09 571 9942 **M** 027 444 7184
E gilbert.balbuena@hilti.com
www.hilti.com

HILTI

Site Test Report

Hilti (New Zealand) LTD Unit B, 750 Great South Rd. Penrose, Auckland, New Zealand
Tel: 0800-444584 Fax 0800-329445

Test Carried out for;

Project: Balustrade Fixings on Timber

Report No. 18-09-2009-01

Site Address:

Test Date: 18/09/2009

Contact: Warwick Allen

Tel No. 021 411 922

Company: Glassvice

Fax No.

Report to;

Name: Ernest Lapish

Company: Lapish Enterprise Ltd

Position: Managing Director

Tel No. 09 625 4823

Fax No. 09 625 4825

Test Location:

Base Material: Timber

Site Plan Attached: Y / N

Comp. Strength: MPa

Product Tested:

Steel UTS: MPa

Test Required: Pull Out Y / N

Proof Load Y / N

if Y specify load KN Design Resistance

Test Device Used: Enerpac RCH302

Serial No. :

Calibration Date: 12/03/2009

Riken P4 Pump SN#23124

TEST RESULTS

Sample No.	Load (kN)	Failure Point Mode (Anchor Break, Base Material, Anchor Pull-out, Nil)	Comment
1	21.0	RE500 + M10 rods, embedment 130mm on timber	timber failure
2	23.6	RE500 + M10 rods, embedment 130mm on timber	timber failure
3	27.0	RE500 + M10 rods, embedment 130mm on timber	timber failure
4	20.7	RE500 + M10 rods, embedment 130mm on timber	timber failure
5	29.7	RE500 + M10 rods, embedment 130mm on timber	timber failure
6	30.1	RE500 + M10 rods, embedment 130mm on timber	timber failure
7	24.3	RE500 + M10 rods, embedment 130mm on timber	timber failure
8	28.4	RE500 + M10 rods, embedment 130mm on timber	timber failure
9	25.1	RE500 + M10 rods, embedment 130mm on timber	timber failure
10	23.6	RE500 + M10 rods, embedment 130mm on timber	timber failure
11	34.6	RE500 + M10 rods, embedment 130mm on timber	timber failure
12	29.6	RE500 + M10 rods, embedment 130mm on timber	timber failure

Comments:

rods are 316 stainless

Test Conducted by: G. Balbuena

Signed:

Witnessed by Client: W. Allen / E. Lapish

Signed:

Hilti Engineer: G. Balbuena

Signed:

Report Date: 21/09/2009

MATERIALS & TESTING LABORATORIES LIMITED

Destructive & Non-destructive Test House

CERTIFICATE OF TEST

Report No. 27105/2
Page 1 of 1 page

Reference: HILTI (NZ) LIMITED
Order No: 20090302
Attention: Volker Hünert

Calibration Verify of Gauge, Pump, Cylinder Combination

Test Equipment: Verified against - Shimadzu Universal Grade 1 Testing Machine, Model UH 500KN1, Serial No. 121054600016. Calibration due February 2010.

Sample Identity: Enerpac Gauge GF-813B CL 1.0.
Enerpac Hollow Ram, HYT 103. RCH 302.
Riken Pump Type P-4 Serial No. 23124.

RESULTS:

Observed Gauge Force Kilonewtons	Recorded Force Testing Machine Kilonewtons			Mean
0	0	0	0	0
25	25	25	25	25
50	48	48	48	48
75	71	71	71	71
100	96	97	96	96
125	119	120	120	120
150	144	144	144	144
175	170	169	170	170
200	194	194	194	194
225	218	218	218	218
250	244	244	245	244
275	268	269	268	268
300	290	291	290	290

Tested by: JS
Date tested: 2/03/09
Reported by: JS
Date reported: 3/03/09
Checked by:

Signed: ....
J. SAUNDERS

P.O. BOX 14-042, PANMURE, 172g MARUA RD, MT. WELLINGTON , AUCKLAND, N.Z. TEL: 579 0262 FAX: 579 0260 Email: mtlabs@xtra.co.nz

AIREY
CONSULTANTS LTD.

TEST REPORT
FOR
GLASS VICE PRODUCTS LTD.
M10 COACH SCREWS INTO TIMBER

Job Number: 180297

Issue Date: 12/5/2021

Document Control Record

Document Prepared By:
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Level 1, Fountain Lane North, Botany Town Centre
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E: mamoonj@aireys.co.nz
W: aireys.co.nz

Client:
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Rosedale, Auckland 0632

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Document Issue Schedule				
Rev. No.	Date	Description	Prepared by	Approved by
	12/5/2021	M10 coach screws into timber	MJ	DM

AIREY CONSULTANTS LTD. Consulting Civil and Structural Engineers

Pukekohe Takapuna Howick Queenstown

CLIENT:	SHEET No.: 1
JOB:	JOB No.:
CALCS. BY: PHONE:	DATE:

(5) Scion Testing 10φ SS screws 130 mm penetration into dry timber 7 August 2009

Faced fixed only ; 6 samples.

$A_{Vx} = 205.77$ N/mm $\quad 3696.82 \; \Sigma(x - A_{Vx})^2 \quad SD = 27.19$

$V_{sc} = 0.132$

	10	13.2	15
5	1.28	1.395	1.46
6		1.375	
10	1.21	1.293	1.34

$\Rightarrow k_t = 1.375$

$\Rightarrow$ Design load = $\frac{\text{ult. test load}}{k_t}$

$= \frac{174 \text{ N/mm}}{1.375}$

$= 126.54$ N/mm

Test in to wet timber

Face fixed only 6 samples

$V_{sc} = 12.13\%$

	10	12.3	15
5	1.28	1.363	1.46
6		1.344	
10	1.21	1.270	1.34

$k_t = 1.344$

$\Rightarrow$ Design load = $\frac{119.76 \text{ N/mm}}{1.344}$

$= 89.11$ N/mm

Refer spreadsheets

Glass Vice Test for Coefficient of Variation - Coach Screws into Dry Timber

Test Date	7-Aug-09	Samples 2/290x45x300
Conducted by	Scion	Screw penetration 90mm
Overseen by	Earnest Lapish	Load rate 2.5mm/minute

Standard Deviation and Coefficient of Variation

Screw penetration 90mm into dry timber

Dry timber	**x (N/mm)** Test load at failure	**x - Avx**	**(x-Avx)^2**			**Outcome**	
Face fixed	174	-31.77	1009.23				
Face fixed	176.4	-29.37	862.50				
Face fixed	207.9	2.13	4.54				
Face fixed	213.12	7.35	54.05				
Face fixed	246.3	40.53	1642.82				
Face fixed	216.89	11.12	123.69				
Edge fixed							
	205.77 Avx		3696.82 Σ(x-Avx)^2	SD =	27.19	sample standard dev	
			Coefficient of Variation = SD/Avx		0.132	13.2	%
			From AS/NZS 1170.0 2002 kt =		1.38		
			Design load = min test load / kt =		127	N/mm	

2

Glass Vice Test for Coefficient of Variation - Coach Screws into Wet Timber

Test Date	7-Aug-09	Samples 2/290x45x300
Conducted by	Scion	Screw penetration 90mm
Overseen by	Earnest Lapish	Load rate 2.5mm/minute

Standard Deviation and Coefficient of Variation

Screw penetration 90mm into wet timber

Wet	**x (N/mm)** Test load at failure	**x - Avx**	**(x-Avx)^2**
Face fixed	168.7	25.72	661.56
Face fixed	137.86	-5.12	26.21
Face fixed	119.76	-23.22	539.13
Face fixed	158.17	15.19	230.76
Face fixed	134.08	-8.90	79.20
Face fixed	139.305	-3.67	13.50
Edge fixed			
Edge fixed			
	142.98 Avx		1550.35 Σ(x-Avx)^2

Outcome

SD = 17.61 sample standard deviation

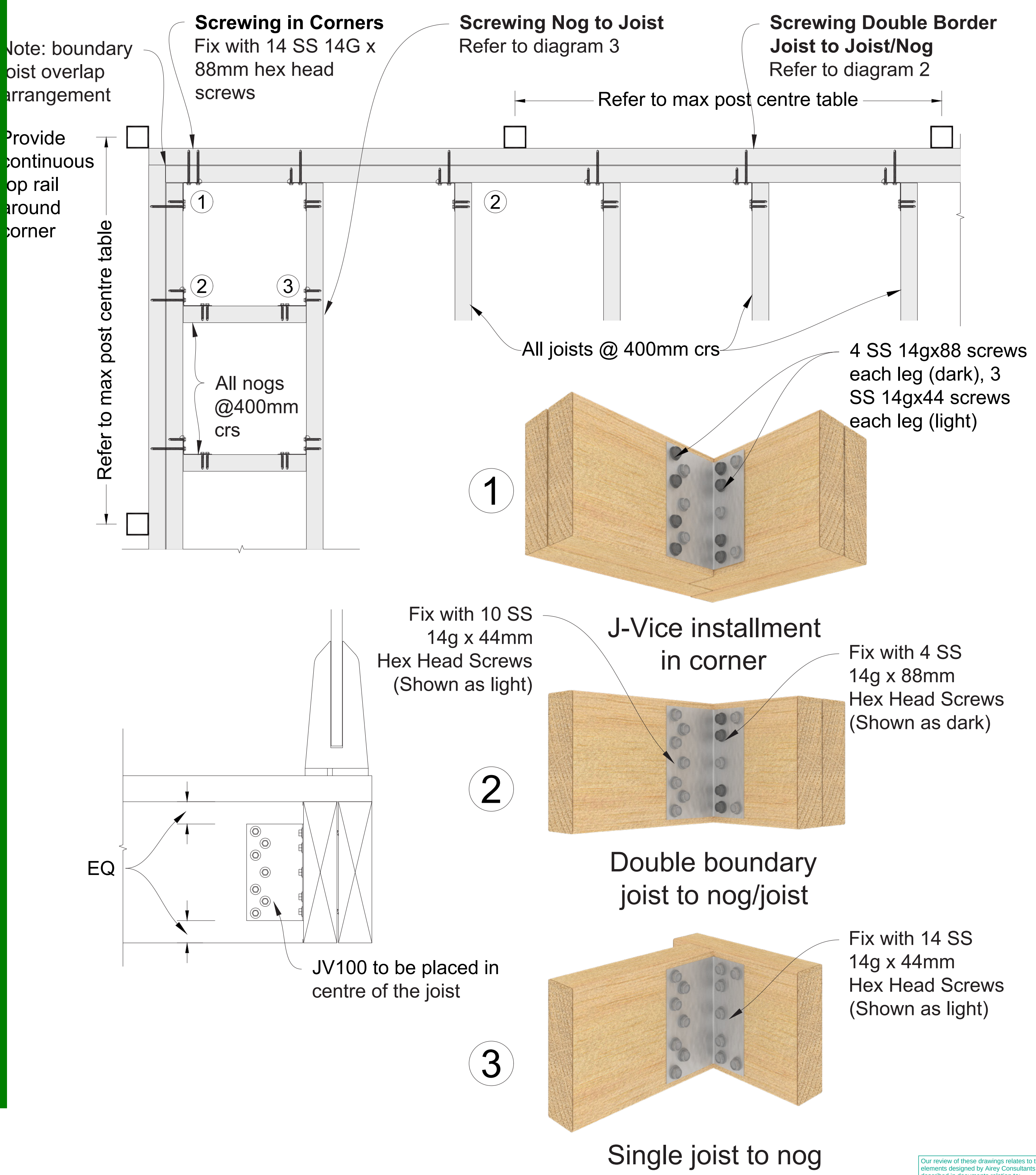
Coefficient of Variation = SD/Avx 0.123 12.3 %

From AS/NZS 1170.0 2002 kt = 1.34

Minimum test load (kg)	120	N/mm	
Design capacity	89	kN/mm	i.e. lowest test load / kt

Typical Double Boundary Joist Timber Deck Construction Details
Alternative solution to NZS 3604:2011 7.4.1.3
Supports joists and cantilevered barrier.
Deck designer to ensure the structure can support the appropriate horizontal and vertical loads.

Compatible with Glass Vice side fixed barrier systems, refer to barrier documentation.



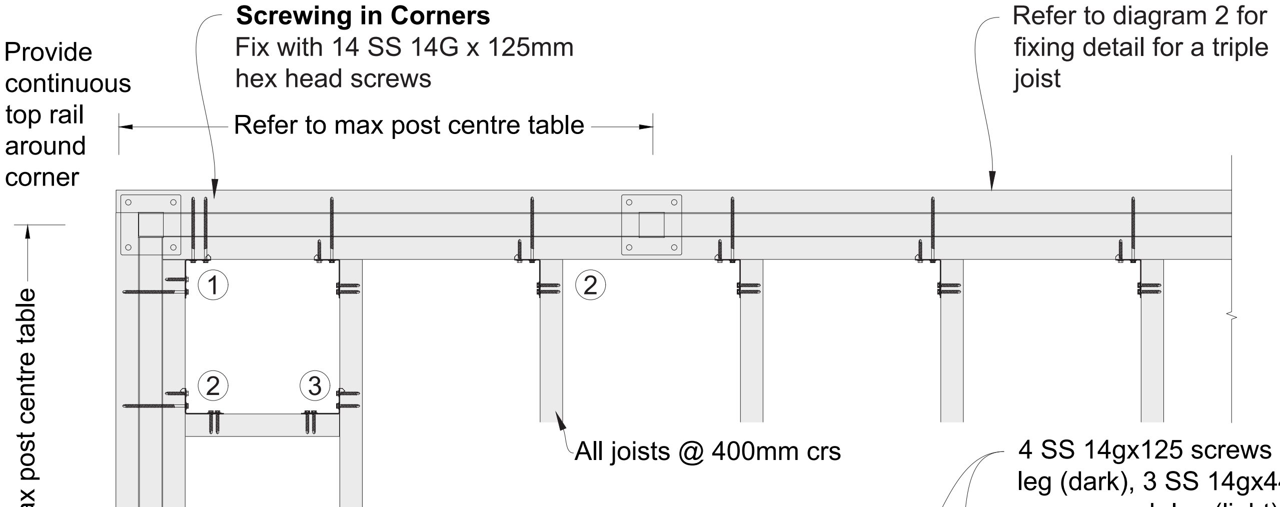
*All fixings must be 316 stainless steel

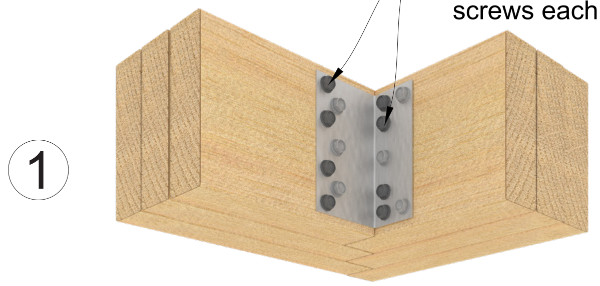
Double

J-VICE®

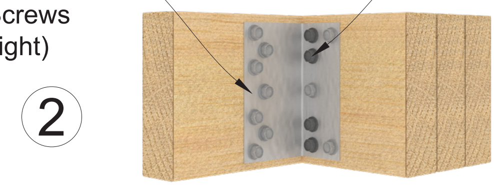
Typical Double Boundary Joist Timber Deck Construction Details
Alternative solution to NZS 3604:2011 7.4.1.3
Supports joists and cantilevered barrier.
Deck designer to ensure the structure can support the appropriate horizontal and vertical loads.

Compatible with Glass Vice top fixed barrier systems, refer to barrier documentation.

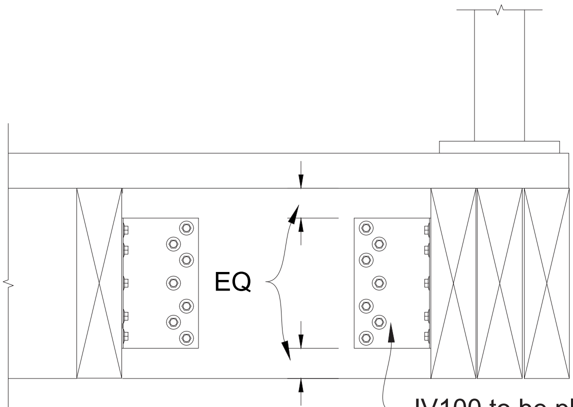


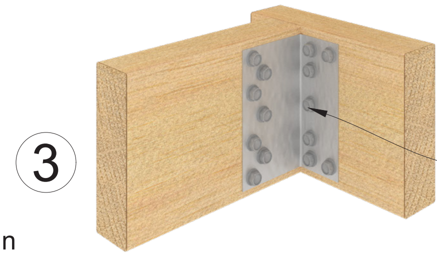


JV100 Triple joist corner detail



Triple boundary joist to nog/joist





Single joist to nog/joist

*All fixings must be 316 stainless steel

Triple

Glass Vice JV100 Post Centres Summary

Maximum Post Centres [2]			
	Joist size at 400 mm centres (JV100 both ends of all joists and nogs) [4]		
Load height above F.F.L. [1]	140 x 45	190 x 45	240 x 45
1000	1400	1800	2000
1100	1250	1600	1850
1200	1100	1400	1650
1300	950	1200	1400
1500	700	950	1100
1800	500	650	800

1. Finished Floor Level (F.F.L.) max 40mm above top of joists.
2. Assumes approved post and rail cantilevered barrier system or compatible Glass Vice barrier system. Max post centres shall be the smaller of this table and the barrier system documentation.
3. All boundary joist and joist nailing that is omitted in these drawings to be done in accordance with NZS 3604.
4. Based on:
   - Maximum joist span as per Section 7.1 of NZS 3604:2011
   - Maximum permanent load of 0.40 kPa and permanent load of 2.00 kPa
   - SG8 sawn timber in wet service conditions

TEST REPORT
FOR
GLASS VICE PRODUCTS LTD.
JV100

Job Number: 180297-05

Issue Date: 9/11/2020

Document Control Record

Document Prepared By:
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Document Issue Schedule				
Rev. No.	Date	Description	Prepared by	Approved by
A	29/5/2019	JV100 Test Report – replaced	MJ	DM
B	9/11/2020	JV100 Test Report	MJ	DM

Executive Summary

The J-Vice 100 bracket (JV100) for deck barriers with a load of 0.75 kN/m is certified by testing. The bracket fixes the deck joists to the boundary joist. It resists twist from barrier loads and simultaneously works as a joist hanger. Four prototype samples with 140x45 joists and four with 190x45 joists were tested. No yielding of the bracket was observed at serviceability loads. The ultimate load achieved was taken at a deflection of 100 mm for a 1 metre high barrier. The post spacing and barrier height limitations are reported below.

1 Introduction

1.1 Applications and Scope

The J-Vice 100 (JV100) is intended for exterior deck barrier situations with horizontal/vertical line loads of 0.75 kN/m as per Table 3.3 of AS/NZS 1170.1:2002. The JV100 provides resistance to two loads: (1) vertical load from the deck joists and barrier and (2) rotation due to horizontal loads on the barrier. The deck joists may be supported by the boundary joist or the joists may cantilever to support the barrier. In the former case, the design of the bearer/boundary joist is not covered by this certificate and is subject to specific engineering design. All joists and nogs shall have a JV100. It is assumed that an approved barrier system is used.

1.2 Assumptions and limitations

The following apply to the use of the JV100:

- Lateral restraint is provided to all deck joists. This may be from appropriate full depth blocking, decking and/or another system.
- Maximum wind zone of Very High as defined in NZS3604:2011
- The barrier is not:
  - On a parapet
  - On a building greater than 3 storeys or 10 metres high
  - Anywhere $C_{pn} \geq 1.2$

1.3 Description of product tested

Airey Consultants Ltd has been engaged by Glass Vice Products Ltd. to undertake testing to demonstrate compliance with the applications stated above. The JV100 bracket shown in Appendix G was tested. Drawings showing correct application of the JV100 are also included.

2 Test Method

Testing was undertaken under the supervision of Airey Consultants Ltd. Design loads were determined according to NZS1170.1 Table 3.3 for 0.75 kN/m line load type barriers. The design SLS and ULS design loads were factored up by an estimated k_t factor (determined according to NZS1170.0) and a $1/k_{wet}$ factor (according to NZS3603) to determine the target test load. The design load calculation is given in Appendix A.

The first tests were done with the horizontal barrier load and vertical joist load applied simultaneously. The boundary joist was supported and the vertical load was applied to the two joists using an anchor testing jack as shown in Figure 1 (a). The eccentricity of the vertical load on the joists created a restoring moment in the JV100 and countered the moment created by the horizontal barrier load. The observed capacity with simultaneous horizontal and vertical load was therefore greater than that with horizontal load only. Thereafter, all tests were done with horizontal load only and support was provided to the joists as shown in Figure 1 (b). Four samples each for 140 x 45 mm and 190 x 45 mm SG8 timber joists were tested. Some tests were also done with vertical load only.

Figure 1 – (a): Simultaneous vertical and horizontal load (190 deep joists shown), and (b) Horizontal load only (140 deep joists shown)

3 Test Results

The test results and design capacity calculations are given in Appendix B. The maximum barrier height and fixing centres are given in Table 1 below. The maximum post centres are limited by the infill spread load for taller barriers. The underlying calculations are provided in Appendices D and E.

Table 1 - Maximum post centres for deck barriers (mm)

Load height above F.F.L. (mm)	Minimum Joist Size (mm) (all joists min SG8 H3.2 @400crs max)		
	140x45	**190x45**	**240x45**
1000	1400	1800	2000
1100	1250	*1600*	1850
1200	*1100*	*1400*	*1650*
1300	*950*	*1200*	*1400*
1500	*700*	*950*	*1100*
1800	*500*	*650*	*800*

Post centres in *italics* are governed by wind if the barrier panels are solid and it is in a very high wind zone

4 Interpretation and Discussion

4.1 Data and interpretation

The deflection was recorded at the same height as the load. A dummy post with no load was used to record deflection so that the flexibility of the post is excluded from the recorded deflection. The purpose of the tests is to report the characteristics of the JV100 and not the cantilevered barrier system itself. The deflection reported here only considers the rotation of the boundary joist relative to the deck joists.

The moment capacity of the JV100 with 190 mm deep joists determined from testing was extrapolated by calculation to estimate the moment capacity with deeper joists. This was done based on the increased lever arm to the bracket about the pivot point – see Appendix C. A reduction factor of 8% was applied to compensate for the reduced reliability caused by extrapolation. This reduction factor was arbitrarily chosen based on engineering judgement formed from test observations.

4.2 Design capacity

Yielding of the bracket was considered failure under the SLS and a deflection of more than 100 mm at a barrier height of 1000 mm was considered failure under the ULS. The 100 mm deflection only considers the rotation of the boundary joist relative to the deck joists. The ULS load was held for 15 minutes.

4.3 Deflection

The serviceability test load was determined as the design serviceability load multiplied by a k_t of 1.2 based on NZS1170.0. The deflections at the design serviceability load are reported in Table 2. No k_{wet} factor was applied when tested dry to demonstrate the effect of moisture content on the deflection.

We note that the 'Guidance on Barrier Design' document published by the Ministry of Business Innovation (March 2012) recommends a maximum deflection of H/60 + L/240 or 30 mm, whichever is smaller. The deflections reported here are in excess of this recommendation. However, in our experience achieving these recommended limits is impractical with timber systems, especially with smaller joists.

Table 2 - Deflections at SLS test load

	140 Joists		190 Joists	
	Deflection	Moisture	Deflection	Moisture
Test 1	44	16%	43	12%
Test 2	27	14%	55	40+%
Test 3	27	13%	60	40+%
Test 4	26	14%	48	40+%
	mm		mm	

Deflections are reported as at 1000 mm above F.F.L. due to the rotation of the boundary joist relative to the joists only

5 Conclusions

The JV100 tests showed no yielding of the bracket until after the SLS load. Some yielding of the bracket occurred thereafter while maintaining integrity of the bracket and screws in all tests.

6 Site Verification Requirements

As stated in Section 1.

7 Certification

Airey Consultants Ltd. hereby certify that we have reviewed the JV100 as specified in the drawings attached in Appendix G for compliance with current New Zealand Standards.

Prototype tests were undertaken and the design capacity was calculated according to NZS 3603:1993, AS/NZS 1170.0:2002 and the Guidance on Barrier Design (MBIE, 2002).

No liability is accepted by Airey Consultants Ltd, its Servants or Directors, for non-compliance arising from incorrect installation, construction or maintenance. The PS1 attached in Appendix H is to be read with the drawings in Appendix G.

8 Appendices attached to this Report

Appendix A1 – Design Load - JV100 on 140x45 Joists @400crs
Appendix A2 – Design Load - JV100 on 190x45 Joists @400crs
Appendix B1 – Design Capacity from Tests - JV100 on 140x45 Joists @400crs
Appendix B2 – Design Capacity from Tests - JV100 on 190x45 Joists @400crs
Appendix C – Capacity with Deeper Joists
Appendix D – Maximum Post Centres for Barrier Loads - JV100 on Joists @ 400crs
Appendix E – Maximum Post Centres for Wind Loads - JV100 on Joists @ 400crs
Appendix F – Vertical Load Tests
Appendix G – Drawings of JV100 Including Application to Deck
Appendix H – Producer Statement - Design Review (PS1)

Signed on behalf of Airey Consultants Ltd

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APPENDIX A1 - DESIGN LOAD - JV100 ON 140x45 JOISTS @400CRS

Scenario			
Load height above F.F.L.	1000	mm	
Joist depth	140	mm	
Joist centres	400	mm	
Post centres	1400	mm	
Barrier Horizontal Load			
Line load	0.75	kN/m	AS/NZS 1170.1:2002
Load factor	1.5		
P_h* per post	**1.58**	**kN**	Design load at rail height
Top of joists to F.F.L. max	40	mm	
Load height above top of joists	1040	mm	
Depth to pivot (from U/S of joists)	30	mm	
Load height above pivot	1150	mm	
M* total	1.81	kNm	Design moment about pivot
n	2		Share by n JV100
M* per JV100	**0.906**	**kNm**	Design moment about pivot
Deck Joist Vertical Load			
Joist centres	400	mm	
Max joist span	2.5	m	NZS3604:2011 - Table 7.1 (b)
Permanent load	0.4	kPa	
Imposed load	2.0	kPa	
G load factor	1.2		
Q load factor	1.5		
P_v* each end of joist	**1.74**	**kN**	Design joist vertical load

APPENDIX A2 - DESIGN LOAD - JV100 ON 190x45 JOISTS @400CRS

Scenario			
Load height above F.F.L.	1000	mm	
Joist depth	190	mm	
Joist centres	400	mm	
Post centres	1800	mm	
Barrier Horizontal Load			
Line load	0.75	kN/m	AS/NZS 1170.1:2002
Load factor	1.5		
P_h* per post	**2.03**	**kN**	Design load at rail height
Top of joists to F.F.L. max	40	mm	
Load height above top of joists	1040	mm	
Depth to pivot (from U/S of joists)	25	mm	
Load height above pivot	1205	mm	
M* total	2.44	kNm	Design moment about pivot
n	2		Share by n JV100
M* per JV100	**1.22**	**kNm**	Design moment about pivot
Deck Joist Vertical Load			
Joist centres	400	mm	
Max joist span	3.4	m	NZS3604:2011 - Table 7.1 (b)
Permanent load	0.4	kPa	
Imposed load	2.0	kPa	
G load factor	1.2		
Q load factor	1.5		
P_v* each end of joist	**2.37**	**kN**	Design joist vertical load

APPENDIX B1 - DESIGN CAPACITY FROM TESTS - JV100 ON 140x45 JOISTS @400CRS

Scenario

Joist: 140x45 SG8 Boundary Joist: 2/140x45 SG8

Bracket: JV100 to one side of two joists with 7/14G x 88 mm Type 17 SS screws into double boundary joist and 7/14G x 44 mm Type 17 SS screws into joist

Load height above joists	1040	mm	
Joist depth	140	mm	
Depth to pivot	30	mm	(from U/S of joists)
Load height above pivot	1150	mm	

Test conducted by: Glass Vice Products Ltd.

Test observed by: Airey Consultants Ltd. Engineer: MJ

See test report for further test information

	Test load at 100 mm deflection [1] x (kN)	x - Avx	(x-Avx)^2	Moisture			
Test 1	2.20	-0.02	0.00	16%	kwet	0.8	applied to all
Test 2	2.28	0.06	0.00	14%			
Test 3	2.28	0.06	0.00	13%			
Test 4	2.12	-0.10	0.01	14%			
	2.22		0.02		SD =	0.075	sample standard dev
	Avx		Σ(x-Avx)^2				

Coefficient of Variation = SD/Avx	0.034		
kt	1.15	AS/NZS 1170.0 2002 Table B1	
Minimum test load (kg)	2.12	kN	
Design capacity = min test load / kt	**1.84**	**kN**	total
JV100 Design moment capacity with 140 joists	2.12	kNm	total
Shared by	2		
JV100 Design moment capacity with 140 joists	1.06	kNm	per JV100
JV100 Design moment capacity with 140 joists LTD.	**0.906**	**kNm**	per JV100, limited

Notes

1 The deflection recorded in the test is expressed as equivalent deflection for a barrier 1000 mm above F.F.L. based only on the rotation of the boundary joist relative to the deck joist.

2 The design moment capacity has been limited here based on comparison with the 190 joist tests and engineering judgement to achieve maximum post centres of 1400 mm for 1000 mm high barriers.

APPENDIX B2 - DESIGN CAPACITY FROM TESTS - JV100 ON 190x45 JOISTS @400CRS

Scenario

Joist:	190x45 SG8		Boundary Joist:	2/190x45 SG8
Bracket:	JV100 to one side of two joists with 7/14G x 88 mm Type 17 SS screws into double boundary joist and 7/14G x 44 mm Type 17 SS screws into joist			
Load height above joists	1040	mm		
Joist depth	190	mm		
Depth to pivot	25	mm	(from U/S of joists)	
Load height above pivot	1205	mm		

Test conducted by: Glass Vice Products Ltd.

Test observed by: Airey Consultants Ltd. Engineer: MJ

See test report for further test information

	Test load at 100 mm deflection [1] x (kN)	x - Avx	(x-Avx)^2	Moisture			
Test 1	2.67	0.45	0.21	12%	k_{wet}	0.8	applied to test 1
Test 2	2.45	0.23	0.05	40+			
Test 3	2.36	0.14	0.02	40+			
Test 4	2.45	0.23	0.05	40+			
	2.48		0.33		SD =	0.132	sample standard dev
	Avx		Σ(x-Avx)^2				

Coefficient of Variation = SD/Avx	0.053		
kt	1.16	AS/NZS 1170.0 2002 Table B1	
Minimum test load (kg)	2.36	kN	
Design capacity = min test load / kt	**2.03**	**kN**	total
JV100 Design moment capacity with 190 joists	2.45	kNm	total
Shared by	2		
JV100 Design moment capacity with 190 joists	**1.22**	**kNm**	per JV100

Notes

1 The deflection recorded in the test is expressed as equivalent deflection for a barrier 1000 mm above F.F.L. based only on the rotation of the boundary joist relative to the deck joist. Peak load from test 1 stated here was calculated by reducing the dry test load by the k_{wet} factor.

APPENDIX C - CAPACITY WITH DEEPER JOISTS

Design max moment per JV100 for 190 joists	1.22	kNm			
Joist depth	190	240	290	mm	
Pivot depth from joist U/S	25	22	20	mm	est.
JV100 depth	130			mm	
Centre of top 3 lateral screws to top of JV100	26			mm	
Joist depth above & below JV100	30	55	80	mm	
Lever arm top 3 lateral screws to pivot[1]	109	137	164	mm	
Design moment capacity about pivot	**1.22**	**1.54**	**1.84**	**kNm**	
	From test	Extrapolated by calculation			

Notes

1 The top three laterally loaded screws contributed the most to the resistance and to the deflection (which limited the ultimate load adopted from the tests). Taking the lever arm to the top 3 laterally loaded screws is conservative when calculating the capacity of deeper joists. Lever arm to screw group centroid would be more accurate.

APPENDIX D - MAX POST CRS FOR BARRIER LOADS - JV100 ON JOISTS @ 400CRS

Top edge line load	0.75	kN/m
Infill spread load	1.0	kPa
Load factor	1.5	
Each post barrier load shared by	2	JV100

Max post centres - 140 Joists

Design moment capacity per JV100	0.91	kNm
Top of joists to F.F.L. max	40	mm
Joist depth	140	mm
Observed depth to pivot (from U/S of joists)	30	mm

Load ht. above F.F.L.	Load ht. range	Load ht. average	Load per metre length	Load ht. above pivot	Max load per JV100	Max load per post	Max post crs	**Max post crs rounded[1]**
1000				1150	0.79	1.58	1400	**1400**
1100				1250	0.72	1.45	1288	**1250**
1200				1350	0.67	1.34	1193	**1150**
1300				1450	0.62	1.25	1110	**1100**
1500	1500	750	2.25	900	1.01	2.01	894	**850**
1800	1800	900	2.70	1050	0.86	1.73	639	**600**
mm	mm	mm	kN	mm	kN	kN	mm	**mm**

Notes

1. Max post centres reduced based on engineering judgement and comparison with 190 joist tests.
2. Infill assumed to extend down to F.F.L., i.e. load ht. to btm = 0 mm
3. Post spacing governed by infill spread load for 1500 mm and taller barriers.
4. Notes 2 and 3 also apply to 190 and 240 mm deep joists.

Max post centres - 190 Joists

Design moment capacity per JV100	1.22	kNm
Top of joists to F.F.L. (max)	40	mm
Joist depth	190	mm
Depth to pivot (from U/S of joists)	25	mm

Load ht. above F.F.L.	Load ht. range	Load ht. average	Load per metre length	Load ht. above pivot	Max load per JV100	Max load per post	Max post crs	**Max post crs rounded**
1000				1205	1.02	2.03	1807	**1800**
1100				1305	0.94	1.88	1669	**1650**
1200				1405	0.87	1.74	1550	**1500**
1300				1505	0.81	1.63	1447	**1400**
1500	1500	750	2.25	955	1.28	2.57	1140	**1100**
1800	1800	900	2.70	1105	1.11	2.22	821	**800**
mm	mm	mm	kN	mm	kN	kN	mm	**mm**

Max post centres - 240 Joists

Design moment capacity per JV100	1.54	kNm	from Appendix C
Top of joists to F.F.L. max	40	mm	
Joist depth	240	mm	
Depth to pivot (from U/S of joists)	22	mm	

Load ht. above F.F.L.	Load ht. range	Load ht. average	Load per metre length	Load ht. above pivot	Max load per JV100	Max load per post	Max post crs [1]	**Max post crs rounded**
1000				1258	1.22	2.45	2015	**2000**
1100				1358	1.13	2.27	1866	**1850**
1200				1458	1.06	2.11	1738	**1700**
1300				1558	0.99	1.98	1627	**1600**
1500	1500	750	2.25	1008	1.53	3.05	1358	**1350**
1800	1800	900	2.70	1158	1.33	2.66	985	**950**
mm	mm	mm	kN	mm	kN	kN	mm	**mm**

Notes

1 Safety factor of 1.08 applied because extrapolating test results using calculation.

APPENDIX D - MAX POST CRS FOR WIND LOADS - JV100 ON JOISTS @ 400CRS

$C_{p,n}$	1.2	AS/NZS 1170.2:2011 Appendix D2, generally [1]
Wind zone	Very High	To NZS3604:2011
Wind speed	50	m/s
Solidity ratio	100%	
k_p	1	
Net Pressure	1.80	kPa

Max post centres - 140 Joists

Design moment capacity per JV100	0.906	kNm	from Appendix B1
Top of joists to F.F.L. (max)	40	mm	
Joist depth	140	mm	
Depth to pivot (from U/S of joists)	30	mm	

Load ht. above F.F.L.	Load ht. range	Load ht. average	Load per metre length	Load ht. above pivot	Max load per JV100	Max load per post	Max post crs	**Max post crs rounded**
1000	1000	500	1.80	650	1.39	2.79	1548	**1500**
1100	1100	550	1.98	700	1.29	2.59	1307	**1300**
1200	1200	600	2.16	750	1.21	2.42	1118	**1100**
1300	1300	650	2.34	800	1.13	2.26	968	**950**
1500	1500	750	2.70	900	1.01	2.01	745	**700**
1800	1800	900	3.24	1050	0.86	1.73	532	**500**
mm	mm	mm	kN	mm	kN	kN	mm	**mm**

Max post centres - 190 Joists

Design moment capacity per JV100	1.22	kNm	from Appendix B2
Top of joists to F.F.L. (max)	40	mm	
Joist depth	190	mm	
Depth to pivot (from U/S of joists)	25	mm	

Load ht. above F.F.L.	Load ht. range	Load ht. average	Load per metre length	Load ht. above pivot	Max load per JV100	Max load per post	Max post crs	**Max post crs rounded**
1000	1000	500	1.80	705	1.74	3.47	1931	**1900**
1100	1100	550	1.98	755	1.62	3.24	1639	**1600**
1200	1200	600	2.16	805	1.52	3.04	1409	**1400**
1300	1300	650	2.34	855	1.43	2.87	1225	**1200**
1500	1500	750	2.70	955	1.28	2.57	950	**950**
1800	1800	900	3.24	1105	1.11	2.22	684	**650**
mm	mm	mm	kN	mm	kN	kN	mm	**mm**

Max post centres - 240 Joists

Design moment capacity per JV100	1.54	kNm	from Appendix C
Top of joists to F.F.L. (max)	40	mm	
Joist depth	240	mm	
Depth to pivot (from U/S of joists)	22	mm	

Load ht. above F.F.L.	Load ht. range	Load ht. average	Load per metre length	Load ht. above pivot	Max load per JV100	Max load per post	Max post crs	**Max post crs rounded**
1000	1000	500	1.80	758	2.03	4.06	2257	**2250**
1100	1100	550	1.98	808	1.91	3.81	1925	**1900**
1200	1200	600	2.16	858	1.79	3.59	1661	**1650**
1300	1300	650	2.34	908	1.70	3.39	1449	**1400**
1500	1500	750	2.70	1008	1.53	3.05	1131	**1100**
1800	1800	900	3.24	1158	1.33	2.66	821	**800**
mm	mm	mm	kN	mm	kN	kN	mm	**mm**

Notes

1 Exclusions include anywhwere $C_{pn} \geq 1.2$. See AS/NZS 1170.2 for details

APPENDIX F - VERTICAL LOAD TESTS

Joist Depth	**140**		**190**	**mm**
Number of samples		1		
Assumed coefficient of variation		0.10		Assumed in the absence of multiple samples
k_t		1.5		AS/NZS 1170.0 2002 Table B1 (rounded up)
Minimum test load per JV100 (kg)	3.0		5.0	kN
Design capacity = min test load / k_t	**2.0**		**3.3**	**kN**

Notes

1. Not tested to failure because the main purpose was to test loads for the deck joist scenario.
2. The vertical deflection at the loads reported was approximately 2-3 mm.